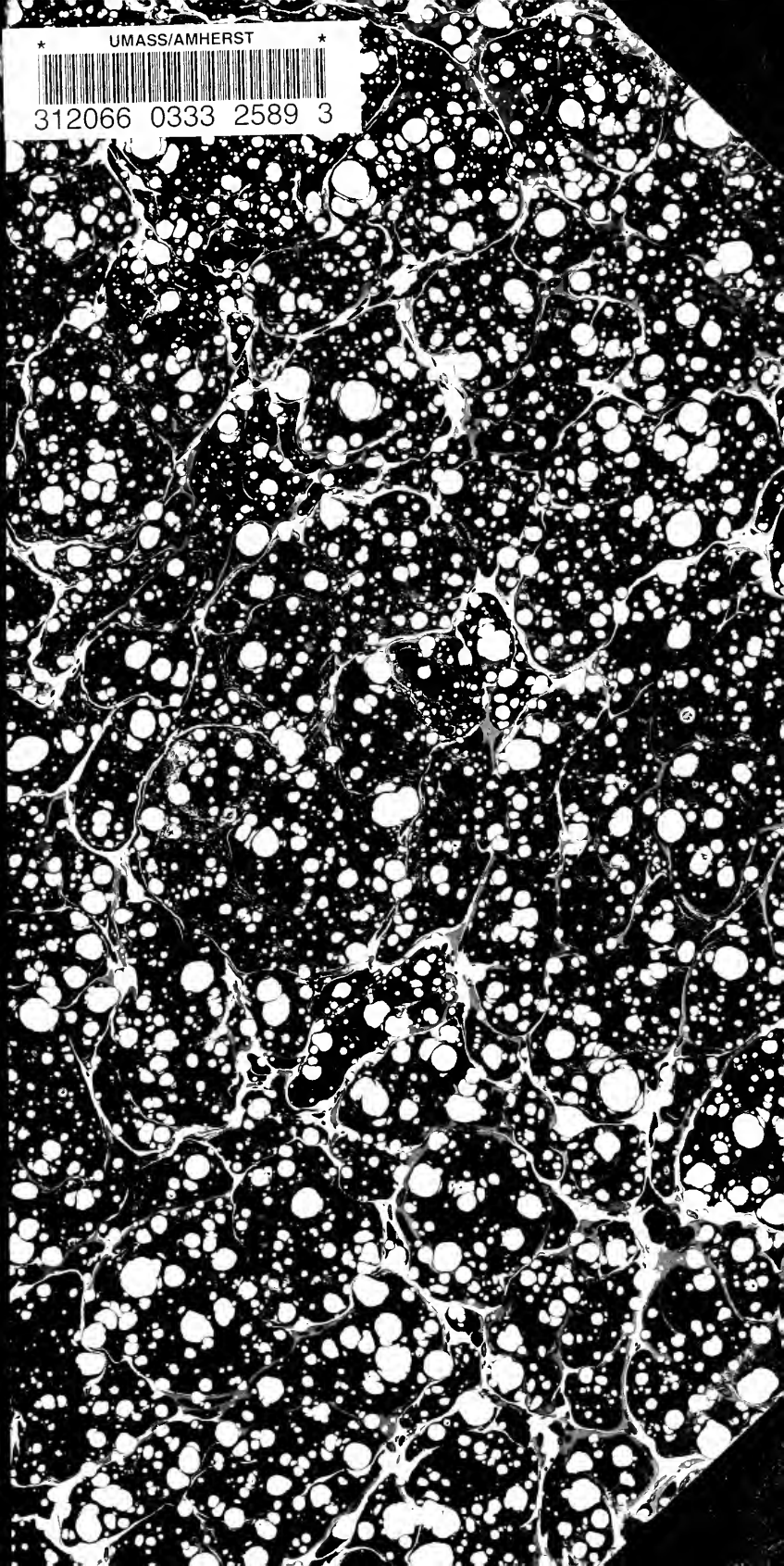


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SERIES OF 1896.

BULLETIN No. 1.

MASSACHUSETTS CROP REPORT

FOR THE

MONTH OF MAY, 1896.

ISSUED BY

WM. R. SESSIONS,
SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF MAY, 1896.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., June 1, 1896.

In Bulletin No. 1, Crop Report for the month of May, we present the first of our series of monthly crop bulletins for the current year. These bulletins will not vary much in general style and plan from those of preceding seasons, and we shall endeavor to issue them as near the close of the month as possible. Although we do not this year assist financially in the issuance of the weekly crop bulletins of the Weather Bureau, the section director, Mr. J. Warren Smith, has kindly arranged for the sending of them to all those on our mailing list. The first number was issued under date of April 28. As heretofore, a short article by one of the specialists of the Board of Agriculture will be included in each issue. This bulletin contains a report of the meetings of the Massachusetts Fruit Growers' Association, by the botanist and pomologist of this Board, who is also secretary of the association.

REPORT ON FARM ANIMALS.

[Report No. 123, U. S. Department of Agriculture, Division of Statistics.]

There is a decided falling off in the number of horses throughout the interior, on the Pacific slope, in parts of the Rocky Mountain and upper Missouri regions, and a slight decrease in the Atlantic States; elsewhere there is a prevailing increase. The total falling off in number amounts to 769,261, or 4.8 per cent. The decline in New York, New Jersey and Pennsylvania is attributed to the introduction of electric and cable cars and to the increased use of the bicycle. The average price has fallen from \$36.29 in 1895 to \$33.07, or a decrease of \$3.22. The only fairly acceptable figures anywhere commanded are for good road-

sters and fancy stock. Colts are unsalable in many sections and breeding has been largely discontinued.

There is a slight gain in the number of mules in the cotton belt and a considerable loss in the central region, due to discontinuance of breeding. Total loss in number, 54,162, or 2.3 per cent, about half that of horses. The average price has fallen from \$47.55 in 1895 to \$45.29, or a fall of about 4.8 per cent.

North of the Potomac milch cows generally increased in number, owing to the city demand. In central and south central regions there is a decrease, on account of the high price of feed; elsewhere in the West there is an increase, due to the increased interest in dairying and starting of creameries. The demand continues steady. The average price has risen from \$21.97 in 1895 to \$22.55. The decrease in number over the whole country amounted to 367,043, or 2.2 per cent.

The total decline in the number of oxen and other cattle amounts to 2,278,807, or 6.6 per cent. The decline is generally ascribed to drought and food scarcity and the raising of fewer calves. The increase in value per head is quite general except in the Atlantic States. The average price in January, 1895, was \$14.06; in 1896, \$15.86, or an increase of 12.8 per cent.

The decline in the number of sheep was 3,995,281, or 9.4 per cent. The cause generally assigned is the low price of wool. In spite of the decrease in numbers, the wool clip is slightly larger than that of last year, owing to a more favorable winter. The average price has risen from \$1.58 in 1895 to \$1.70, or an increase of 7.6 per cent.

The number of swine in the country declined 1,322,957 during the year, or 3 per cent. Cholera and other diseases were the leading causes of the decline. The average price fell from \$4.97 in 1895 to \$4.35, a decrease of 12.5 per cent.

On Jan. 1, 1896, there were estimated to be 15,124,057 horses on farms and ranches in the United States, valued at \$500,140,186; 2,278,946 mules, valued at \$103,204,457; 16,137,586 milch cows, valued at \$363,955,545; 32,085,409 oxen and other cattle, valued at \$508,928,416; 38,298,783 sheep, valued at \$65,167,735; 42,842,759 swine, valued at

\$186,529,745; total value of farm animals, \$1,727,926,084, as against \$1,819,446,306 in 1895.

The number of horses on farms in Massachusetts was 65,-102; average price, \$72.49; value, \$4,719,255. Milch cows, 174,572; average price, \$34.63; value, \$6,045,428. Oxen and other cattle, 80,476; average price, \$26.36; value, \$2,121,662. Sheep, 48,395; average price, \$3.30; value, \$159,703. Swine, 60,726; average price, \$8.44; value, \$512,647.

The condition of farm animals, except in a few States along the Atlantic seaboard, is reported as generally good, partly because of the unprecedented corn crop and its low price.

PROGRESS OF THE SEASON.

The May returns of the United States Department of Agriculture (Report No. 137) show an increase in the condition of winter wheat of 5.6 points above the April average, being 82.7, against 77.1 last month and 82.9 in May, 1895. The principal winter-wheat States nearly all show an improvement in condition. Special reports show excellent prospects in Great Britain and France, and other foreign countries generally good, Spain being the only exception.

The condition of barley is 89.2, against 94 in May, 1895. In New York, the greatest barley State, the condition stands at 90. The condition of winter rye on May 1 was 87.7 per cent.

The condition of spring pastures on May 1 was 93.6 per cent, as against 89.7 in 1895, an unusually high condition, attained on account of the spring rains and favorable temperature, in spite of the lack of snow during the winter in some States and the effects of the late feeding last fall.

Though many correspondents report meadows as injured by last year's drought, the timely April rains and high temperature have induced rapid growth, and the condition on May 1, 1896, stood at 91.8, against 89.4 last year and 91.7 in 1894.

Fine weather and a moist soil have made the season an ideal one for spring ploughing, and the amount accomplished by May 1 was 79.6 per cent, 1.9 points above the average, and nearly up to the figures of 1895.

WEATHER SUMMARY, JANUARY - APRIL, 1896.

[FURNISHED BY THE NEW ENGLAND WEATHER SERVICE.]

January opened cold, and an unusually sharp cold wave prevailed from the 4th to the 8th. At Boston fully sixty people were treated at the Emergency Hospital on the 6th for frost bites. The temperature ranged very near zero all day and a high, cutting wind prevailed. Peach buds were almost entirely killed by this cold wave and some damage was done to raspberries and blackberries. Its passage was well forewarned by the Weather Bureau. The last part of the month was milder, but with no pronounced thaw. The ground was not protected by snow during the cold spell, but there was a slight covering during the rest of the month.

February was a rough, stormy month, with damaging floods, heavy snows and an excess of rainy and cloudy weather. The heaviest rainfall was over the north central part of the State. The rain of the 4th to 7th gave from two to three inches in that section, but no serious damage resulted. The snow and rainfall of February 29 to March 3 was not so heavy in this State as in northern New England, but the damage done by rivers flowing into Massachusetts from the north was very great. A severe cold wave prevailed on the 17th and 18th, with a strong wind blowing. The most marked cyclone of the month originated near Texas, on the 4th, moved easterly, then northerly, passing across our State just west of Boston on the night of the 6th - 7th. Hurricane signals were hoisted along our coast for the first time in the history of the Weather Bureau, and were fully justified, as the wind reached a velocity of over 60 miles an hour. On the 11th, at about 9 A.M., while a cyclone centre was passing down the St. Lawrence valley, a short but very severe snow squall or "snow shower" passed easterly across our State. The darkness was almost night-like, and the air was filled with fine, driving snow.

March weather was typical of the month, though rougher and more stormy than usual. The rainfall was considerably above the normal and the number of stormy days in excess of the usual amount. The snowfall was more than usual and there was a fair snow covering till near the end of the month.

The wind movement at Boston was far above the average and at interior stations from 2,000 to 5,000 miles in excess of the usual March record. The changes in temperature during the month were rapid, but the daily ranges were not extremely great.

The first and last parts of April were comparatively cool, with frequent frosts, but the middle of the month gave almost unprecedented heat for the season. The temperature recorded over 80° in western districts on the 15th, 16th, 17th and 18th. East winds lowered the maximum along the coast on the 16th and 17th. The rainfall was deficient, and at the end of the month grass and grain were feeling the effects of dry weather. Thunderstorms prevailed on the 17th, 18th, 19th and 21st, that of the 17th being widespread and severe. Farm work was carried on under favorable circumstances and well advanced at the end of the month. The cool weather of the last week of the month held the fruit buds in check, with favorable results.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES WEATHER-CROP BULLETINS.]

Week ending May 4. — Warmer than usual in all districts east of the Rocky Mountains except on the immediate coast. In the plateau regions and on the Pacific coast week cooler than usual, being decidedly cool in portions of California and throughout Oregon and Washington. The usual amount of rain fell in the upper Mississippi and Missouri valleys and over portions of the Gulf, Middle and South Atlantic States. On the Pacific coast the rainfall was exceptionally heavy; elsewhere it was less than usual, a considerable part of New England receiving none. East of the Rocky Mountains the week has been very favorable for farm work.

Week ending May 11. — Fifth successive week of abnormally high temperatures east of the Rocky Mountains, the excess being very great north of the Ohio and Missouri rivers. Abnormally cool on the Pacific coast and in the plateau districts; elsewhere nearly normal temperatures. No appreciable rainfall from the Rocky Mountains eastward except over limited areas. On the Pacific coast and in the

Rocky Mountain regions the rainfall was in excess. The seasonal rainfall is largely deficient throughout Atlantic coast districts. Week generally favorable for farm work east of the Rocky Mountains.

Week ending May 18. — Week abnormally warm throughout the Mississippi valley and eastward. In the upper Missouri valley and throughout the Rocky Mountain and Pacific coast regions week cooler than usual. There is a seasonal excess over the eastern half of the country and deficiency over the western. Rainfall greater than usual in the lower Missouri and upper Mississippi valleys. Throughout the Atlantic and east Gulf States less than the average amount of rain fell. No appreciable rain in New England. The effects of drought have been quite seriously felt in the Atlantic coast States and in the Ohio valley.

Week ending May 25. — Seventh successive week of excessive temperatures east of the Rocky Mountains, except in New England, where it was slightly cooler than usual. In the plateau regions and on the Pacific coast cooler than usual. In the Missouri, Ohio and central Mississippi valleys and the greater portion of the middle Atlantic States the rainfall exceeded the average. In the lake region and over the greater part of the Southern States less than the usual amount fell. Only light showers fell in northern New England. Abundant rains have relieved the droughty conditions in the Ohio valley and generally in the middle Atlantic States, but in New England the drought continues.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending May 4. — New England. Boston : Cool and pleasant, with sharp frosts, but no serious damage resulting ; only a trace of rainfall, and top of ground is too dry except on lowlands, where conditions are unusually good ; fruit buds showing well.

Week ending May 11. — New England. Boston : Pleasant weather, with much sunshine and extremes of temperature ; favorable for farm work, but too dry for seed in places ; while grass grows slowly, and most garden and field

crops are at a standstill for want of rain; fruit, except peaches, giving full blossoms.

Week ending May 18. — New England. Boston: Warm days, cool nights, plenty of sunshine and extremely dry; grass being seriously damaged by drought and crops growing slowly; forest fires frequent and severe; corn planting under way in south and begun in north.

Week ending May 25. — New England. Boston: Cool, with sharp frosts on several mornings, causing slight damage to fruit and early vegetables; heavy showers along southern coast and everything benefited; only light showers in interior and crops suffering; tobacco setting begun; cranberries budding full.

WEATHER FOR MAY, 1896.

Unusually fair, warm and dry weather prevailed over the greater part of Massachusetts during the month of May. At Boston two-thirds of the days gave an excess in temperature, while the average daily excess for the month was about 4°. At Fitchburg the month averaged 2.5° a day warmer than usual. Light frosts prevailed in eastern districts on the 20th, 21st and 24th, but no damage of amount was done.

The ground was getting rather dry on all the uplands at the beginning of the month, and as only an occasional trace of rain fell during all the first two-thirds of May, it is feared that much damage has been done to grass lands and some field crops. On the 19th a moderate shower fell in southeastern counties, and again on the 21st the soil was well moistened in that section; but in the western part of the State hardly enough came to lay the dust till the last few days of the month. On dry lands grass has headed out while standing only a few inches in height, and it is thought this crop must be permanently shortened for this season. Seed put into the ground has come very slowly, and on some fields it has been too dry to plough. The weather has been favorable for insect pests, and they have flourished accordingly. Canker worms have done unusual damage in orchards in the eastern part of the State. Many report they have never seen tent caterpillars so thick, and others

say that cut worms are attacking every plant that has a root soft enough to be eaten. The frosts have not been hard enough to damage fruit buds to any extent, and the outlook for fruit is very flattering. Apples blossomed from a week to ten days earlier than the average.

In the circular to correspondents returnable May 25 the following questions were asked :—

1. How does the present season compare, agriculturally speaking, with last season?

2. What is the promise for pastures and mowings, and did fall seeding winter well?

3. How did the fruit bloom compare with the bloom of former years?

4. What insects appear to be doing the most damage in your neighborhood?

5. To what extent is spraying practised against insects attacking fruit, and is it on the increase in your locality?

6. Is farm help scarce, or plenty, and what proportion would you call good help?

7. What wages, with board and without board, are paid farm help in your vicinity?

8. What proportion does the production of fruits and small fruits bear to general farming in your locality, and is it increasing from year to year, or otherwise?

Returns have been received from 157 correspondents, and from them the following summary has been made up* :—

THE SEASON.

Correspondents vary very much in their replies to this question, but the general opinion seems to be that the season opened from one to two weeks earlier than last year. The extreme drought which prevailed during the month, together with cold and variable weather, has, however, operated to check the growth of all crops, and it is probable that the season is at the present time but little in advance of last year. Many correspondents indeed speak of the season as

* The great majority of these returns were received before the recent general rains, and the conditions at present are probably much better than those which they describe.

backward. The rains of May 26 and 28 were general throughout the State, and should do much to advance the growth of all crops.

PASTURES AND MOWINGS.

The drought has shortened feed in pastures, and some correspondents report that stock is fed in the barns as much as in winter. Old mowings will be very light, and the crop will probably be shortened on all except very moist fields. The drought has been most severe in the western portion of the State, and the worst reports of condition come from that section, though only isolated instances of good condition are anywhere reported. The recent general rains did much to relieve the drought. Fall seeding cannot be said to have wintered well, there being many complaints of winter-killing. The drought has also injured new-seeded fields and reduced their general average of condition.

FRUIT BLOOM.

Apples made a very abundant bloom, probably the fullest ever known in this State. The bloom of pears was very light, and there will be but few harvested. Plums and cherries are also below the average, though not so light as pears. There will be practically no peaches. The quince bloom, where mentioned, is spoken of as full. Small fruits generally blossomed full. Where the fruit bloom is reported on as a whole, it is generally spoken of as abundant.

INSECTS.

Insects, aside from the canker worm, do not appear to be doing more than the usual amount of damage. Tent caterpillars are most frequently reported, but are not unusually abundant. Canker worms are doing considerable damage in the eastern part of the State, and many orchards will suffer severely. Cut worms and currant worms appear to be fairly plenty. Other insects mentioned are the elm-tree leaf beetle, the borers, grasshoppers, the potato beetle, the maple louse, the cabbage maggot, the white grub, the asparagus beetle and the cranberry vine worm and fire worm.

SPRAYING.

Spraying is practised to only a slight extent, except by those who make fruit growing a specialty. It is slowly but steadily increasing, however, and more is done each year. More attention should be paid to this by all farmers who rely upon fruit production for any portion of their income, as the outlay will invariably be repaid by an increase in both the quantity and quality of the fruit secured. Paris green is the insecticide most commonly used, and can be applied in the proportion of one pound to one hundred and fifty gallons of water. Arsenate of lead, a new insecticide recently discovered by the gypsy moth committee of the State Board of Agriculture, is, however, to be preferred, as it can be applied at any desired strength without danger of burning the foliage. This makes it a much safer insecticide than Paris green in unskilful hands, and also makes it possible to use strength sufficient to practically exterminate any of our common insects. It also adheres very closely to the foliage, and the addition of one quart of glucose to one hundred and fifty gallons of the mixture will cause it to stick to the leaves through practically an entire season, in spite of heavy rain storms. It has been found to be effective against the tent caterpillar and potato beetle at the strength of one pound to one hundred and fifty gallons of water, but a greater proportion may be required for some insects. This insecticide can now be obtained through any of the prominent Boston seed stores. The high cost of spraying apparatus has undoubtedly deterred many small growers from using insecticides. All such are recommended to investigate the "hydrosprayer" or common brass hand syringe, which is described by Dr. Jabez Fisher on page 166 of "Agriculture of Massachusetts" for 1891. It is thought that this little implement will be found efficient in a great many cases. When the canker worm is present, spraying should be resorted to as soon as the worms appear, otherwise the first general spraying should be made just before the opening of the blossoms. If Paris green is the insecticide used, a good general rule would be to spray three times after blossoming. If arsenate of lead is used, prob-

ably two of these sprayings could be dispensed with, except possibly when the codling moth is the insect to be especially combated, in which case the first spraying should be made immediately after the falling of the blossoms. If it is desired to use fungicides in connection with insecticides, either Paris green or arsenate of lead may be mixed with Bordeaux mixture in the same proportions as with water.

FARM HELP AND WAGES.

Farm help seems to be plenty in most cases, though there is the usual complaint as to the difficulty of securing really first-class help. If anything, there is perhaps a little more good help to be had than in former years. Some correspondents speak of foreigners, mostly Poles and Portuguese, as making good help, with experience. Wages vary widely in range. Perhaps the average wage is from \$16 to \$20 per month and board. Without board wages are about \$10 higher, \$35 with house rent and garden patch being paid in some cases. Wages by the day range from \$1.25 to \$2. Probably \$1.25 is paid in the great majority of cases, the higher rates being those which prevail in haying and harvesting time.

FRUIT PRODUCTION.

The answers to question 8 varied so widely that it is very difficult to summarize them satisfactorily. It is safe to say that the production of fruits and small fruits is generally increasing throughout the State. In the eastern sections the proportion to general farming seems to be much greater than in the central and western portions. This is probably due to their comparative nearness to market, and the increased interest in the cultivation of small fruits arising from it. In some sections crops like strawberries and cranberries form the greater proportion of the farm products. In the western portions of the State apples are practically the only fruit grown for market, though some growers make specialties of other fruits.

NOTES OF CORRESPONDENTS.

[Returned to us May 25.]

BERKSHIRE COUNTY.

New Marlborough (L. P. KEYES). — Pastures and mowings are suffering from severe drought. Fall seeding did not winter well. The apple bloom was very full, but pears, peaches and cherries showed few blossoms. No insects doing damage this season. There is no spraying done here. Farm help is equal to the demand and about half is good help. Wages are from \$16 to \$18 per month with board and from \$28 to \$30 without. The production of apples is on the increase. The drought is assuming serious proportions in this vicinity.

Becket (WM. H. SNOW). — The season is fully as early as last year and not quite as dry. Pastures and mowings look well. The fruit bloom was full this year. The tent caterpillar is not as bad as usual. I do not think spraying is much practised. Help seems to be plenty at present and probably half of it is good. Wages are \$20 per month with board and \$30 to \$35 without. The production of fruit bears a very small proportion to general farming. Grass will be thin in some places, on account of the past two dry seasons.

West Stockbridge (WM. C. SPAULDING). — The season is ten days to two weeks earlier than last year. Pastures and mowings are needing rain, and will be light unless it comes soon. Apples bloomed well, pears very little. Currant worms are doing some damage. Spraying is not at all practised. Help is plenty enough, half of it good. Wages \$1.25 per day without board. Production of fruits small and not increasing.

Hancock (C. H. WELLS). — The planting season is about the same as last year, but fruit blossoms were much earlier. Pastures and meadows are very dry and grass promises a poor crop. Fall seeding is in poor condition. The apple bloom was abundant, but that of pears, cherries and plums scattering. Tent caterpillars and canker worms are doing some damage. Two or three farmers are spraying and I think more are to follow. Farm help is not plenty; perhaps one-third is good help. Wages are \$15 to \$18 per month with board and \$22 to \$25 without. The production of

fruit forms only a small proportion of general farming, but more attention is paid to small fruit each year.

Cheshire (L. J. NORTHUP). — Season somewhat in advance of last year. Pastures and mowings are short, owing to the very dry spell; fall seeding looks well. Pears and plums did not bloom, but apple trees never bloomed more fully. Spraying is being done to some extent and is on the increase. The tent caterpillar is the most plentiful insect. Farm help is plenty and good. Wages from \$18 to \$20 per month with board; without board, \$10 additional. Small fruits are not much raised, but are rather increasing.

Williamstown (S. A. HICKOX). — The season is not nearly as favorable as last year. Pastures are poor and hay will not be more than half a crop. The fruit bloom was good. Tent caterpillars are doing some damage. Spraying is practised to a very small extent. Help is plenty and about 25 per cent is good help. Wages are \$10 to \$20 per month with board and \$25 to \$35 without. Fruit production forms a very small proportion to general farming, but is increasing.

FRANKLIN COUNTY.

Rowe (J. F. BROWN). — The present season is better than last year. With rain, pastures and mowings promise well. Fall seeding is in better condition than usual. The fruit bloom was never better. The tent caterpillar is doing some damage. Spraying is but little practised and is not increasing. Farm help is plenty and is all good. Wages are \$1 per day with board and \$1.50 without. The production of fruits and small fruits is very small. Spring opened early and we had a fine sugar season.

Colrain (A. A. SMITH). — The season is earlier by two weeks than last year and dryer by four weeks. Fall seeding looks well, but pastures and mowings need rain. The fruit bloom was much fuller than last year, apples very full. Tent caterpillars and currant worms are doing some damage. Spraying is very little practised; I don't know of a single instance in town. Farm help is plenty, if you hire Polanders and such, and they are good, as a rule. Wages average about \$16 per month with board. The production of fruits and small fruits is increasing.

Conway (J. C. NEWHALL). — The season is far from an average one. No feed in the pastures, and without rain soon there will not be half a crop of hay. Fall seeding looked well, but has not grown much and shows much sorrel. Apple trees bloomed very full, but other trees showed a light bloom. Tent caterpillars, currant worms and grasshoppers are doing some damage. Very

little spraying is being done. Help plenty and generally good. Wages from \$15 to \$25 per month with board and from \$20 to \$30 without. Otherwise than apples, the production of fruit is very small. You may think I have a severe attack of the blues, but I have lived on this farm seventy years, and regard this year as the most discouraging of any. It is cold and dry, there is nothing growing, and prices of farm produce are of the lowest. Farms are depreciating in value every year. Are we ever to have a change?

Sunderland (J. M. J. LEGATE). — The season is not as favorable as last year, on account of drought and wind. Pastures are very short and the hay crop will be far below the average. Fall seeding wintered quite well, but the drought has used it up. Apple trees blossomed very fully, pears but little and peaches not at all. Few insects doing damage as yet. No spraying is done here. Help is very plenty and most of it is good. Wages are from \$15 to \$18 per month with board and \$1.25 per day without. But little attention is paid to the production of fruits for market and there is no material increase. The wind storm of the 18th ruined nearly three-fourths of the onions in town, blowing the soil badly on light land. Rain must come soon, or crops will be light.

New Salem (DANIEL BALLARD). — The season is ten days earlier than last year and much dryer. Pastures and mowings are below the average, on account of drought. Some pieces of fall seeding winter-killed. Large bloom of apples, not much of pears and none of peaches; small fruits bloomed well. Tent caterpillars and currant worms are plenty. Spraying is but little practised, but is increasing. Farm help is rather scarce; one-half is good help. Wages range from \$10 to \$18 per month with board and from \$1.25 to \$1.50 per day without. Fruit production bears the proportion of one-third to general farming and is on the increase.

HAMPSHIRE COUNTY.

Prescott (W. F. WENDERMUTH). — Drought has injured pastures and mowings considerably. Fall seeding winter-killed badly. Apples had the heaviest bloom for years, pears very light and peaches none at all. The tent caterpillar is the only insect doing damage now. No spraying whatever is done. Farm help is rather scarce, but fairly good. Wages are \$20 per month and \$1 per day with board. Apples constitute about one-fourth the money crop and fruit growing is increasing rapidly. Fully one-half the peach trees winter-killed and the rest gave no bloom. Nothing is done in small fruits.

Amherst (W. P. BROOKS). — Season about a week earlier than last year; work well advanced, but soil very dry. Pastures and mowings have a poor chance, unless rain comes soon. Fall seeding generally wintered poorly, there being much heaving of the ground by frost. Apples had an abundant bloom, cherry spare bloom, pear bloom rather thin, quince average, currants average, no peaches. Canker worms have nearly defoliated many apple orchards. Spraying is not much practised, but is on the increase. Farm help is plenty and fully average in quality. Wages with board, \$17 to \$22 per month; without board, \$33 to \$40. The production of fruit is probably not more than 8 per cent of general farming and is not increasing much. Prices are unprecedentedly low. Tobacco setting just begun by a few. The wind storm of the 18th did a great deal of damage.

Northampton (D. A. HORTON.) — The season came forward very fast through April, but May has been very dry and windy. No rain of any amount for six weeks. Pastures, mowings and fall seeding are all below the average. Apples bloomed very full, pears not as well. The elm-tree leaf beetle is doing much damage and the city has purchased spraying apparatus to combat it. Good help is scarce and not more than one-fourth is good. Wages are about \$16 per month with board, \$1.35 to \$1.50 per day without. The production of fruit does not bear the proportion of more than one-tenth to general farming.

Williamsburg (F. C. RICHARDS). — The season is much earlier than last year. Pastures are short, upland mowings half a crop, lowlands in fair condition. The fruit bloom was: pears, 60 per cent; no cherries; no peaches; Baldwin apples, 90; other varieties, 125. Codling moths and canker worms are doing some damage. About one-tenth of fruit growers spray with insecticides, but it is not increasing. No spraying with fungicides done as yet. Farm help is very scarce and none of it good help. Wages are from \$10 to \$18 per month with board and about \$35 without. Fruit production forms about 35 per cent of general farming and is rapidly increasing.

Goshen (ALVAN BARRUS). — The season is dry, dryer, driest. Pastures and mowings look as if there were an Egyptian blight upon them. Apples blossomed finely, peaches not at all, pears and most other fruits very lightly. Tent caterpillars are doing some damage. Little spraying has been done in the past, but more will be done this year. Tramps are plenty, but not one in ten is good help. Wages are \$20 per month with board. There is a growing interest in the production of all kinds of fruits, apples leading, as the markets are too far away to make the production of small fruits generally profitable.

HAMPDEN COUNTY.

Tolland (E. M. MOORE). — The season is earlier than last year, with weather favorable for planting. Mowings and pastures are drying up and need rain. Fall seeding wintered fairly well. The fruit bloom was quite up to the average. There is scarcely any spraying practised here. Help is scarce and a very small proportion can be called good help. Wages are \$20 per month with board and \$1.25 per day without. The production of apples is on the increase, but not much is done in the production of small fruits.

Russell (E. D. PARKS). — The season is not so favorable as last year, on account of dry weather. The prospect for both mowings and pastures is very poor. Fall seeding wintered quite well. Fruit bloom was rather fuller than usual. Tent caterpillars are quite plenty. But little spraying is done here. Good help is scarce, but there is plenty of cheap labor. Wages range from \$12 to \$20 per month with board. Fruit production about one-sixth of general farming and rather on the increase. Planting is backward, as farmers are waiting for rain.

West Springfield (T. A. ROGERS). — Farmers are not over-enthusiastic in regard to the season. Both pastures and mowings are not growing, for want of rain. Some fall seeding winter-killed. There were few blossoms on any fruit except apples and plums. Canker worms, the elm-tree leaf beetle and tree lice are doing some damage. Some are spraying, but to a limited extent. Help is mostly good in this immediate vicinity. Wages are from \$18 to \$25 per month with board and \$1.50 per day without. Perhaps one-eighth of the gross income of farmers is from fruits. The ground is so dry that seeds sprout very slowly.

Wilbraham (F. E. CLARK). — The season is rather later than usual and very dry. We must have rain soon, or pastures and mowings will suffer. Fall seeding winter-killed in many places. The fruit bloom is more than double the usual bloom and the promise now is for a good fruit crop. Tent caterpillars are abundant and the potato beetle has shown himself. Spraying is not practised as much as it should be. Farm help is scarce and not one-fourth of those who apply are good help. Wages are from \$15 to \$20 per month with board. The proportion of small fruits is increasing from year to year.

Wales (CHAS. F. CRAWFORD). — The dry weather has a bad effect on the prospects for the season. All grass is in poor condition. Fruits of all kinds blossomed full and the prospect is for a good crop. Tent caterpillars are on the apple trees, but the damage is not noticeable. Spraying is entirely unknown here.

Farm help is scarce; I think there is only one man in town who hires, and he pays \$1.25 per day without board. Apples are produced abundantly and pears are quite plenty. Other fruits are raised for home use only, but are increasing somewhat. The farms here are small, poor and stony.

WORCESTER COUNTY.

Warren (WM. E. PATRICK).—The season started about a week earlier than last year, but has been retarded by the drought. Pastures and mowings have started well. Fall seeding wintered well and is in good condition. The apple bloom was as full as any ever seen, pears and cherries very light, peaches none. No insects are doing any damage worth mentioning. Very little spraying is done, but I think there is an increase each year. Farm help is scarce; possibly half is good. There has been no material change in the wages paid. The proportion of fruit production is too small to estimate, but I think it is increasing.

North Brookfield (JOHN H. LANE).—The season is in many respects similar to last year. Pastures and mowing will be poor, unless rain comes soon. Our people are feeding at the barn as much as in January. Apple bloom very full and early, no pears, other fruits good. Canker worms and tent caterpillars are doing some damage. Very little spraying is done. Help is scarce and poor, 10 per cent being good. Wages are from \$15 to \$20 per month with board. The production of fruit forms 10 per cent of the general farming.

Petersham (S. B. COOK).—The season is a full week earlier than last year. Pastures and mowings are suffering much from drought. Fall seeding wintered well. Apple bloom unusually abundant; peaches and pears had a light bloom. Tent caterpillars are abundant and the cut worm is working. Very little is done in spraying, but it is on the increase. Farm help is not very scarce, but only about 5 per cent is good help. Wages are \$1 per day with board and \$1.50 without. Fruit production does not form more than 10 per cent of general farming. There have been a good many peach trees set out this year and the area of strawberries has been increased.

Winchendon (W. H. SAWYER).—Pastures and mowings are very poor, as it is very dry. The winter was hard on fall seeding. Fruit trees blossomed very full this year. Tent caterpillars are doing some damage. But very little spraying is done. There is help enough and wages range from \$15 to \$20 per month with board. The production of fruit is very small, but is on the increase.

Fitchburg (Dr. JABEZ FISHER).—The season is much dryer and a little earlier than last year. Grass is suffering for want of rain. Apples had a very full bloom, peaches none, other fruits moderate. Tent caterpillars are doing damage and there are some canker worms and potato beetles. Spraying is practised only to a small extent and is not increasing much. Good help is scarce and poor help plenty. Wages are \$20 per month with board and \$1.50 per day without. The proportion of fruit raised is not large and does not increase very much. The apple bloom occurred on May 11; only twice in forty years has it occurred earlier.

Bolton (H. E. BABCOCK).—The season is earlier than last year and compares favorably. Grass started well, but has not grown well, owing to drought. The fruit bloom was very full, except peaches and pears. Canker worms are doing great damage. A great many are spraying and I think it is increasing. Help is plenty, but good help scarce. Wages are \$15 to \$20 per month with board and \$25 to \$30 without. Fruit production forms but a small proportion of the general farming in this locality and increases but little from year to year.

Worcester (H. R. KINNEY).—Crops that have not suffered from drought are somewhat ahead of last season. Pastures and mowings need rain badly. Early fall-seeded pieces look well. Apples promise a full crop, but there will be few pears and no peaches. Potato bugs are very plenty and currant worms are doing some damage. Spraying is not at all general and is not increasing as much as it should. Good help is never plenty, but I think quantity and quality are about average this season. Wages are from \$18 to \$25 per month with board and \$1.25 to \$1.50 per day without. Apples are raised more or less and a few raise small fruits quite extensively. On the whole, however, I think less fruit is raised in this neighborhood than ten years ago.

Upton (B. A. JOURDAN).—Pastures and grass are very backward, on account of dry weather. Fall seeding looks well, if we could have rain to bring it forward. Fruit made a full bloom, except pears, which were very light. Very little spraying is done here. Help seems to be plenty, but it is very hard to get good help. From \$18 to \$20 per month and board is paid good help. The production of small fruits is very light in this section.

MIDDLESEX COUNTY.

Pepperell (A. N. BLOOD).—The season compares favorably with last year. Pastures are drying up for want of rain and old mowings are light. The fruit bloom was a grand one, as large as I ever saw. Very few insects as yet. Spraying is not practised

to any great extent, but is increasing. Farm help is scarce and about one-half is first class. Wages are from \$16 to \$20 per month with board and from \$1.25 to \$1.50 per day without. Fruits and small fruits form 25 per cent of the money crops and the production is increasing yearly. We must have rain soon, or we shall get no crops.

Lowell (C. L. MARSHALL). — The season is very poor and dryer than last year. Pastures are looking poorly, but fall seeding is doing well. The fruit bloom was very heavy and promises a great crop. Canker worms and grubs are doing some damage. There is very much more spraying than in former years. Help is plenty and a small proportion is good help. Wages are \$18 to \$20 per month with board and \$30 to \$35 without. The proportion of fruit production to general farming is 3 to 2 and small fruits are increasing.

Winchester (MARSHALL SYMMES). — Planting is well advanced, but the drought has checked growth. Pastures and mowings are in bad shape and fall seeding much winter-killed. Apple trees bloomed full, pears light, peaches and plums almost none at all. Tent caterpillars and canker worms are very bad in places and cut worms are bad everywhere. Spraying is on the increase, but is not general as yet. Help is very plenty and about 50 per cent is good help. Wages are from \$7 to \$10 per week without board and \$16 to \$25 per month with board. Fruit growing is not on the increase.

Lincoln (SAMUEL HARTWELL). — The season is about the same as last year. The continued dry weather makes pastures and meadows short; some fall seeding wintered badly. Apples bloomed abundantly, pears very light and no peaches. Canker worms are doing some damage. Help is moderately plenty and three-fourths is good. Wages are \$18 to \$20 per month with board and \$30 to \$40 without. The production of fruit probably equals the general farming and is increasing. Early crops have not germinated well.

Marlborough (E. D. HOWE). — The season compares unfavorably with last year. Pastures and mowings are unusually short. Fall seeding winter-killed considerably. The fruit bloom was 110 for apples, 10 for pears and 5 for cherries. Canker worms are doing some damage. Spraying is practised quite considerably and is rapidly increasing. Help is plenty and about one-tenth is good help. Wages are \$20 to \$25 per month with board and \$1.50 to \$2 per day without. Fruit production forms about one-tenth of the general farming and seems to be increasing.

Sherborn (N. B. DOUGLAS). — The outlook this season is very bad. There has been no rain of any amount since the snow went

and pastures and mowings are in a deplorable condition. There was a full bloom on apple trees, none on peach trees and very little on pear trees. Canker worms have turned 25 per cent of the apple trees brown and cut worms are working. Nearly every one sprays, but the canker worm keeps right on. Help is plenty; one-third is good, one-third passable and one-third good for nothing. Wages are \$18 to \$20 per month with board and \$1.50 per day without. Fruit production forms 40 per cent of general farming and there is a slight increase from year to year. Early sowed oats look fairly well.

ESSEX COUNTY.

Haverhill (EBEN WEBSTER). — With the exception of the rather dry weather, the season compares favorably with last year. Pastures and mowings are looking well, except on high land. Fall seeding was somewhat winter-killed. There were no pear blossoms, but a good bloom of apples. Tent caterpillars are doing some damage. Very little spraying is done, but it is on the increase. Farm help is plenty and fully as good as usual. Wages are \$20 per month with board and \$1.25 to \$1.50 per day without. The proportion of fruit production is small, but increasing.

Salisbury (WESLEY PETTENGILL). — Pastures are very poor and mowings light on high ground. Fall seeding wintered well. Apples bloomed more fully than for years, but pears made a light bloom. Canker worms are doing some damage. Nearly every one sprays for the canker worm and spraying is on the increase. Help is plenty and one in three good help. Wages are from \$18 to \$25 per month with board and \$1.50 per day without board. The production of fruit is increasing, especially apples; but little is done in small fruits.

Newbury (G. W. ADAMS). — The season is late and the drought severe. Pastures and mowings are destroyed. Fall seeding wintered well. The fruit bloom was above the average, except for pears. Canker worms are doing some damage. Fifty per cent of the fruit is sprayed and the practice is increasing. Farm help is rather scarce and ten per cent is good. Wages are from \$20 to \$28 per month with board and \$1.50 per day without. Fruit production is perhaps 15 per cent of general farming and is increasing. There has been practically no rain for six weeks.

Manchester (JOHN BAKER). — The season is more advanced than last year, but much dryer. Pastures and mowings will be poor, unless we have rain soon. Much clover winter-killed. The fruit bloom was much heavier than usual. Tent caterpillars and canker worms are doing some damage and the cut worm is also working.

Spraying is not practised to any great extent, but is increasing. Wages are \$20 to \$25 per month with board and \$1.75 per day without.

Danvers (C. H. PRESTON). — The apple bloom was the largest for years. Tent caterpillars and canker worms are doing some damage. Many do not spray their trees, but the practice is increasing. Farm help is plenty and wages are from \$18 to \$22 per month with board. Fruit production forms not more than 5 or 10 per cent of our farming, but is increasing in amount.

NORFOLK COUNTY.

Medway (MONROE MORSE). — Pastures and mowings do not promise well. Fall seeding did not winter very well. Peaches had no blossoms, pears light, apples abundant, plums and cherries full. Canker worms are doing some damage. Spraying is practised some and the practice is growing. I have been fortunate in getting good help. I pay \$20 per month with board and \$35 with garden patch and house rent without board. The growing of small fruits is increasing. Strawberries will suffer unless rain comes soon.

Franklin (C. M. ALLEN). — The present season is not as good as last year. Pastures and mowings are badly dried up. Fall seeding wintered well. Apples had an excellent bloom, pears light, no peaches, strawberries good. Canker worms and cut worms are plenty. Spraying is practised to a small extent and is on the increase. Help is plenty; about 10 per cent is good help. Wages are from \$15 to \$18 per month with board and \$30 to \$40 without. Fruits form but a small proportion of the farm produce, but their growing is on the increase. We have had very little rain for a long time.

Randolph (R. A. THAYER). — The season is much less favorable than last year, mainly on account of drought. Pastures and mowings are very short, except on moist land. Fall seeding wintered well. Apples bloomed very full, pears a very small bloom, small fruits good. Only a few canker worms and tent caterpillars. Spraying is practised to a very limited extent. Ordinary help is quite plenty, but first-class men are scarce. Wages are \$15 to \$25 per month with board and \$30 to \$40 without. A little fruit is raised and the production is increasing.

BRISTOL COUNTY.

Attleborough (ISAAC ALGER). — The season is not as good as last year, being too dry. Pastures and mowings are very short, especially on high land. The apple bloom was abundant, but

there was no bloom on pears. No spraying done. Help is quite plenty and one-half is good help. Wages are \$20 per month with board and \$1.50 per day without. Very little is done in the production of fruit in this section.

Raynham (N. W. SHAW). — The prospect is not favorable for good crops. It is too dry for pastures and mowings, and fall seeding winter-killed somewhat. Apples had an enormous bloom, but pears bloomed very light. Canker worms and currant worms are doing some damage. Very few spray, but the practice is increasing. Farm help is scarce, except tramps who do not want to work. Wages paid vary widely, according to the quality of the help. I think one-tenth would be a fair proportion to set on fruit production and it is continually increasing.

Dighton (J. N. PAUL). — Crops are not quite so far advanced as last year. Fall seeding wintered well, but meadows and pastures are very light. Apples and strawberries bloomed very full, no peaches and very few pears. Canker worms are doing some damage. Spraying is practised quite generally on strawberries and is on the increase. There is very little farm help, mostly Portuguese. Wages are \$12 to \$20 per month with board and \$1.25 to \$1.50 per day without board. Fruit production forms fully one-half of our farming, but has not increased any for three years. Strawberry vines wintered well, but the crop will be late.

Swansey (F. G. ARNOLD). — Pastures are in fair condition, but mowings have suffered from dry weather and the hay crop will be short. The fruit bloom was about the same as usual. Canker worms are doing some damage. Very little attention is paid to spraying. Farm help is plenty and the majority is good help. Wages are \$16 to \$20 per month with board and \$1.25 to \$1.50 per day without. Strawberries are the principal crop here, but I do not think their production is increasing.

Dartmouth (L. T. DAVIS). — The present season is not as favorable as last year. Pastures and mowings are below the average in condition. Fall seeding is in good condition. Apples made a full bloom, but pears were very light. There are some currant worms, but insects are not very troublesome. Spraying is practised very little and there is no special increase. Farm help is as plenty as usual and possibly one-half are good. Wages are from \$16 to \$25 with board and from \$1.25 to \$1.50 per day without. Fruit production forms not more than one-tenth of our farming and there has been no change for a long time.

PLYMOUTH COUNTY.

West Bridgewater (F. E. HOWARD). — The season is earlier than last year. The promise for pastures and mowings is good now after the rain. Fall seeding wintered well. Apples had a full bloom, but pears and peaches were very light. Canker worms and currant worms are doing some damage. Very little if any spraying is done. There is about the usual supply of help, of which perhaps half is good help. Wages are \$18 to \$20 per month with board and \$1.50 to \$2 per day without. The production of fruits and small fruits bears the proportion of 2 to 1 to general farming and is increasing.

Hanson (F. S. THOMAS, M.D.). — Pastures and mowings promise well and fall seeding wintered well. Apples bloomed fuller than last year, no peaches and few pears. Tent caterpillars are more numerous than last year, but are doing little damage. Not much spraying is done, but our farmers are beginning the practice. People who have fruit trees are beginning to see that they *must* spray to have good fruit. Farm help is plenty and good. Wages are \$1.50 per day for ordinary work and \$2.50 per day in haying. Not much small fruit is raised and it is decreasing.

Plympton (JACOB PARKER). — The present season is not as good as last year. Fall seeding wintered fairly well and pasturing is coming on finely. The fruit bloom was as large as any ever known here. There are very few insects. No spraying done here. Help is plenty and is all very good. Wages are \$2 to \$3 per week with board and \$1.50 per day without. The production of small fruits is increasing. Fruit is setting well.

Lakeville (ELBRIDGE CUSHMAN). — The season is a favorable one. The late rains have made the outlook for pastures and mowings more encouraging. The apple bloom was the largest for years and that of pears the smallest. Spraying practised in perhaps one-fourth the cases and is increasing. Help is plenty and perhaps one-half is good. Wages are from \$15 to \$20 per month with board and from \$25 to \$30 without. Quite a portion of the farm income is from small fruit and it is increasing.

Marion (JAS. H. ALLEN). — The season is about the same as last year. Pastures and mowings do not promise as well as last year. Fall seeding wintered well. The fruit bloom compares favorably with other years. Tent caterpillars are doing some damage. There is not much spraying done in town. Farm help is plenty and about all is good. Most help is hired by the day and the regular wages are \$2. Fruit production averages more than common farming and is on the increase.

BARNSTABLE COUNTY.

Bourne (D. D. NYE). — The present season is fully as good as last year. Pastures and mowings are more promising than they have been for several weeks. The apple bloom was very good, other fruit average. Tent caterpillars are doing some damage. Spraying is not practised except in two cases in town. Help is scarce and three-fourths of it good. Wages are \$25 to \$30 per month and \$2 per day without board. The production of small fruits is three-fourths that of general farming and is increasing from year to year.

Falmouth (D. R. WICKS). — The season is about the same as last year. Pastures and mowings are looking well since the rain of the 19th. Apples made a very large bloom and pears and peaches a fair one. Tent caterpillars and potato beetles are doing some damage. There is no spraying done. Farm help is very scarce and not over 5 per cent is good help. Wages are from \$1.50 to \$2 per day without board. Fruit production forms about 40 per cent of general farming and is on the decrease. Crops generally look as well as ever at this season of the year.

Barnstable (JOHN BURSLEY). — The severe drought and extremes of heat and cold make the season later than last year. All grass is very small at the present time. Tent caterpillars are doing some damage. There is but little spraying, except on cranberries, and flooding is practised on them whenever practicable. Farm help is scarce and 50 per cent is good. Wages are \$20 per month with board and \$1.50 per day without. Fruits, including cranberries, are fully 50 per cent of our market crops.

Dennis (JOSHUA CROWELL). — There is not much difference between this season and last year. Pastures and mowings have suffered from extremely dry weather. The apple bloom was very full and other fruit rather less than average. Tent caterpillars and cranberry-vine worms are doing some damage. But little spraying is done, except on cranberries; the practice is increasing. There is a moderate supply of help. Wages are from \$20 to \$25 per month with board and \$30 to \$35 without. If cranberries are included, the production of fruit will bear the proportion to general farming of nearly 2 to 1, and it is increasing.

Orleans (JOHN KENRICK). — The season is very much behind last year, owing to extreme drought. Grass will be thin, owing to drought. Fall seeding wintered well. The fruit bloom was a fair average. The cranberry-vine worm and the asparagus beetle are doing some damage. Spraying is extensively practised for the cranberry worm and is increasing. But little hired help is

employed and that mainly by the day. Including cranberries, the production of fruit is an important factor in our farming and is increasing. Asparagus is cultivated to a considerable extent.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — The season is somewhat later than last year and crops are backward. The prospect for pastures and mowings will be poor, unless it continues wet. The fruit bloom was about average. Tent caterpillars are doing some damage. Spraying is not practised to any great extent, and is but slightly on the increase. Farm help is equal to the demand and about one in ten is good help. Wages are from \$10 to \$20 per month with board and \$1.50 per day without. Fruit production is very small and not increasing.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER). — It has been very dry and everything is backward. Pastures and mowings are in very poor condition. Fall seeding is all winter-killed. What we call the turnip flea is doing damage to beets, onions and early cabbage. There is no spraying of any kind practised. It is hard work to get good help that can be trusted to do good work and handle a team. Wages are from \$8 to \$20 per month with board. Very little is done in raising small fruits here, some strawberries and blackberries.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

REPORT OF THE MEETINGS OF THE MASSACHUSETTS FRUIT GROWERS'
ASSOCIATION.

By Prof. S. T. MAYNARD, *Secretary*.

For a great many years the amount of fruit consumed by the people of this State has been steadily increasing, but this increase has come not from our own growers but largely from other States and countries. Of the amount of fruit imported into Massachusetts from other States or countries we have no accurate statistics available at this time, but we learn that the city of Boston alone consumed in a single season nearly 2,000,000 cans of apple, and in the city of Worcester a single dealer handled two carloads of the same product; and almost every town or city in the State consumes more or less of apples in this convenient form, none of which are produced by our own fruit growers.

In every city, town or village, evaporated apples, dried plums, peaches and berries are consumed in more or less large quantities; and canned peaches, cherries, raspberries and strawberries are found on the shelves of almost every grocer and provision dealer in the State. During the summer and fall our markets are flooded with fresh fruits from other States: strawberries from Florida, Georgia, Virginia and New Jersey; peaches from most of the Southern States; grapes from the South and West and almost every kind of fruit from the Pacific coast.

No State in the Union, probably, consumes so much fruit per capita as our own; and our fruit growers should make a great effort to secure at least a reasonable share of this immense traffic, and supply more fully than is now done our local markets. In many cases the competition will be between our native and the tropical fruits; but there is no section of the country that can produce better

apples, pears, plums, cherries, grapes, blackberries, raspberries, currants and strawberries, and a large proportion of these fruits consumed by our people should be grown by our growers. Of course we cannot put the fruit into the markets as early in the season as that shipped from the South, but we can put it into the hands of the consumer *in a much better condition*; and if we can keep our markets *fully supplied* with extra choice fruit, either fresh, evaporated or canned, at reasonable prices, we shall cut off, in a large degree, the demand for Southern and Western and inferior fruit.

It is this situation which led to the formation of the Massachusetts Fruit Growers' Association. The first meeting was held at Worcester, March 20, 1895. At this meeting, a two-days session, sixty-seven members were enrolled. Papers were presented on "The care and cultivation of orchards," by Prof. J. W. Clark of North Hadley; "The preparation and packing of fruits for foreign markets," by Geo. A. Cochrane of Boston; "Grape growing in Massachusetts," by H. A. Cook of Shrewsbury; "Insects and fungus pests and remedies," by Prof. S. T. Maynard of the Massachusetts Agricultural College; and "The preservation of fruit by cold storage," by Dr. Jabez Fisher of Fitchburg. Mr. Cochrane advocated in his lecture the packing of fruit for foreign markets in half-barrel boxes, divided into two compartments, and that the fruit should be graded and wrapped as oranges are.

The Massachusetts Fruit Growers' Association was organized, a constitution adopted, and officers elected as follows: president, James Draper of Worcester; vice-president, Samuel Hartwell of Lincoln; secretary, S. T. Maynard of Amherst; treasurer, E. W. Wood of West Newton; auditor, C. L. Hartshorn of Worcester; with a board of twelve directors.

The second meeting was a field meeting, held on the grounds of the Agricultural College at Amherst, on June 14, 1895, with about forty members present. Professor Maynard explained the location of the many points of interest on the grounds. The strawberry experiment plots, where over one hundred and fifty named varieties were in fruit and about the same number of seedlings were fruiting for the first time, were visited. The varieties were studied and tested, but, as no one could test all, conclusions as to the best necessarily varied. The orchards and vineyards were examined; the latter, containing two hundred varieties of grapes trained to the one-arm renewal system, attracted much attention. The greenhouses, the largest glass structures and containing the most complete and extensive collection of economic and commercial plants to be found connected with any agricultural college in the country, were vis-

ited, and the methods of construction, ventilation and heating were especially inspected. The grounds about these buildings, planted with a very large and complete collection of the more choice ornamental trees and shrubs, were also examined. The farm department, including the new and spacious barn, was visited, as was also the experiment station, with its laboratories and experiment plots, after which the meeting adjourned, the members expressing themselves as having passed an unusually pleasant and profitable day.

The first annual meeting of the association was held at the hall of the Worcester Horticultural Society, March 12 and 13, 1896.

THURSDAY — *Morning Session.*

The meeting was called to order by President Draper, who called on O. B. Hadwen to give the address of welcome. The reports of the secretary, treasurer and auditor were presented and accepted. It was voted that standing committees on nominations, legislation, new fruits and membership be formed.

After these preliminary exercises were disposed of, the first topic for discussion was taken from the question list.

First Question: *Apple orcharding, — will it pay to increase planting of the apple, and, if so, what sorts?* — The discussion took a wide range, all agreeing that there was as much profit in apple growing as in any crop grown. Mr. E. W. Wood considered the Baldwin the most profitable variety, but it is losing its vigor, and we must cast about for something to take its place. Mr. Hartwell considered the Gravenstein the most profitable apple, his method of harvesting being to let the apples fall on a mulch of hay, and market them in bushel boxes, selling for \$1 to \$1.50 per box. Mr. Hadwen would not plant Gravensteins on heavy soil; they need some sand in the soil. Other varieties of promise mentioned were McIntosh Red, Sutton Beauty, Palmer Greening, Ben Davis, King, Wagner, etc. The Ben Davis was reported as the longest-keeping red apple, and profitable, but of poor quality; and the King as very uncertain on the thin soils of Massachusetts.

Second Question: *The European market for apples, green or evaporated.* — No one present had had experience with canned or evaporated fruit, but all agreed that well-packed good fruit would sell for paying prices if shipped to Europe. Mr. J. Eames would have the apples packed as far as possible from the boiler of the steamer in which they are shipped, in many cases reported the apples stowed near the boiler having come out in a much decayed and injured condition. Careful picking, sorting and close packing are absolutely necessary to success.

Third Question : *Is it advisable to plant pears or peaches between apples in the orchard, when forty feet or more apart?*—Several speakers discussed this question, the opinion being that peaches could be planted between the apple, but not pears, as the pear is as long lived as the apple. Mr. Wood suggested currants as a good crop to plant under the shade of fruit trees, giving as an instance the Hittinger Brothers of Belmont, who during the past season grew twenty tons of currants under pear and apple trees.

Fourth Question : *Is it desirable to plough orchards late in the season, say in November?*—This question was discussed with a very wide range, but it was generally conceded that it is best to cultivate young orchards continually or until they begin to bear, when many advocated seeding down to grass, and ploughing once in three to five years.

Fifth Question : *Causes of and remedy for scald on apples in winter storage.*—Professor Clark thought the cause too much moisture and heat, and would prevent it by getting the apples into a cool, even temperature as quickly as possible after they are picked.

Sixth Question : *Pruning orchards,—is it practised as generally and as thoroughly as it should be?*—This question was passed over rapidly, but it was generally agreed that trees need some pruning, that many prune too much and some too little, and that the time to prune the trees is while they are young.

Afternoon Session.

Wm. R. Sessions, secretary State Board of Agriculture, in the chair.

Seventh Question : *What is the best winter sweet apple?*—Among the winter sweet apples mentioned were the Honey Sweet, Tolman's Sweet, Danvers Sweet, Green Sweet, Ladies' Sweet.

Eighth Question : *Best treatment for old apple orchards that have been in sod many years? If ploughed, how deep?*—Mr. Hinds pastures colts in orchards; he thinks pigs eat off the fibrous feeding roots. Mr. Eames could see no injury from swine in an apple orchard pastured with them for forty years. Mr. Cruickshanks explained Dr. Fisher's method, he not having ploughed his orchard for fifteen years. No grass is carried away, and a liberal dressing of fertilizer, about eighteen dollars' worth per acre, is applied every year. Captain Palmer would treat the land as any other meadow, plough when the sod was run out, manure enough to get a crop of grass and put it in the barn. His best apples grow in his pasture. Many others advocated constant cultivation. Prof.

L. F. Kinney suggested a compromise of a strip of turf along the line of the trees, and the central portion ploughed, cultivated and fertilized. Mr. Hinds, whose peach orchard was awarded the first prize by the Massachusetts Horticultural Society in 1895, practises the latter method.

Ninth Question: *What is the best way to exterminate the canker worm?* — Paris green applied at the rate of one pound to one hundred gallons of the Bordeaux mixture is the cheapest and best remedy. Application should be made just as they are beginning to hatch out, on average seasons about May 10, and then again in from five to ten days. If tar and ink bands are used, the coating must be kept soft from the middle of October to the middle of April, whenever the frost is out of the ground and the nights are moist and warm. The ink method is simple, cheap and effectual, if properly attended to.

Tenth Question: *The best make and form of spraying pump to purchase for general use?* — Prof. J. W. Clark uses the Douglas pump and Vermorel and McGowen nozzle. Prof. S. T. Maynard suggested that there are many good pumps, but it is best to buy one made near home, in case of breakage of parts. The Douglas Pump Company are thoroughly reliable, and have been in the business of manufacturing pumps for fifty to sixty years.

Mr. J. H. Hale, the speaker of the afternoon, now appeared and spoke on "Progressive horticulture." He said that growing choice fruits is one of the fine arts of agriculture. Fine fruit appeals to the higher natures of the people. Fruit must be of fine quality, and put up in attractive packages. The best place to grow fruit is where the market is. In New England we have the soil and conditions for the growth of all the hardy fruits to the greatest perfection, and in our markets the demand is ahead of the supply for fine fruit. To produce fine fruit, one must have a real love for the work. Let the dollar be the last thing in consideration, and it will often be the first. At all events, that enthusiasm which forgets everything but the necessary condition for the production of the finest product possible will be sure of a liberal reward. Cultivation, fertilization, pruning, thinning, spraying, packing and the package are the most important points to consider. There is no profit and can be none in the production of eighty per cent damaged goods, as is often the result of our fruit growing. The manufacturers of cloth who produced even ten per cent of damaged goods would soon become bankrupt. Of small fruits in New England there are now grown one thousand acres where there was one thirty or forty years ago. Our markets are at our doors, and we must do what we can to supply them, or others will do it for us.

The speaker believed that there is more profit in fruit growing in New England than in the South, but made the strong point that thorough work, perfect fruit and business methods are necessary to success.

Evening Session — Grange Hall.

President Draper announced the standing committees authorized at the morning session as follows: Nominations: O. B. Hadwen, Samuel Hartwell, J. W. Clark, James Draper, Geo. Cruickshanks. New fruits: S. T. Maynard, C. W. Prescott, David L. Fisk, H. W. Moore. Legislation: M. P. Palmer, C. L. Hartshorn, C. A. Gleason, Henry L. Parker. Membership: H. A. Cook, Ethan Brooks, A. G. Sharp, Abel F. Stevens, C. W. Minott, Fred W. Johnson, S. C. Damon.

It was voted that a committee of three be appointed to draw up resolutions favoring the State appropriation for the destruction of the gypsy moth. Geo. Cruickshanks, C. L. Hartshorn and Ethan Brooks were appointed.

Eleventh Question: *What new points in regard to spraying have been learned the past season?* — This question led to a general discussion of the subject, nearly all agreeing that it is becoming more and more apparent each year that we must protect our crops from insect and fungous pests by the use of insecticides and fungicides. Mr. Morse asked if any one had had experience with the use of arsenate of lead. He had tried it, with poor success. Mr. Minott said that one quart of glucose added to one hundred and fifty gallons of the mixture would cause it to adhere to the foliage.

Twelfth Question: *What sorts of fruits have been planted to excess, if any, in Massachusetts?* — No one expressed the thought that any fruits had been planted to excess in Massachusetts, but that there was room for more, if properly taken care of.

Thirteenth Question: *Considering the steady decline in prices, what is the outlook for fruit growers in the future? Is it safe to continue extensive planting?* — It was decided by many that prices for choice fruit had held their own and in some cases advanced in the past few years, while there had been a decline in prices of almost all of the necessities of life. Gluts often occurred, and we must be prepared with cold-storage houses, evaporators and canning establishments to preserve our crops until the market will demand them.

The committee on nominations presented the list of officers as follows: president, James Draper of Worcester; vice-president, Samuel Hartwell of Lincoln; secretary, S. T. Maynard of Amherst; treasurer, E. W. Wood of West Newton; auditor, C. L. Hartshorn of Worcester; directors, Essex County, E. A. Emerson of Haver-

hill; Suffolk County, Wm. R. Sessions of Boston; Plymouth County, Augustus Pratt of North Middleborough; Norfolk County, A. F. Stevens of Wellesley; Middlesex County, M. P. Palmer of Groton, Jonathan Eames of Sherborn; Worcester County, Geo. Cruickshanks of Fitchburg, Benj. A. Nourse of Westborough; Hampden County, Ethan Brooks of Springfield; Hampshire County, F. C. Richards of Williamsburg, J. W. Clark of North Hadley; Berkshire County, A. G. Sharp of Richmond.

It was voted that the secretary cast one vote for the entire list of officers, as presented, which was done, and all were declared elected.

Fourteenth Question: *Which are the best, barn-yard or chemical manures for bearing fruit trees, or a combination of both?* — Mr. Hinds uses chemicals, largely bone and potash, for orchards, and pastures colts in them, with good results. Other members discussed the subject, bringing out the points that the kind of land makes much difference as to what and how much fertilizing material should be used; potash tends to make fine and well-colored fruit; nitrogen large size, but not so good quality.

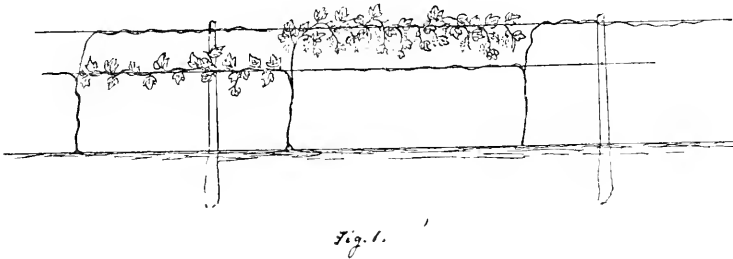
Fifteenth Question: *Should new varieties of fruits be tested at the experiment stations before they are offered to the public?* — It was generally agreed that they should, but it was suggested that duplicate tests be made in different parts of the State, all agreeing that some protection is needed to save the fruit grower the great expense of buying at high prices every new thing that is offered, when in nine cases in ten they are inferior to the old standard sorts. The results obtained in tests at Amherst proved generally correct for other sections of the State, but duplicate tests are needed, to hasten the work and make it more exact.

As to varieties of fruits, the winter pears best suited to New England conditions mentioned were Anjou and Dana's Hovey; of raspberries, the Cuthbert; of blackberries, the Snyder, Agawam and Taylor's Prolific; of strawberries, the Haviland, Bubach, Greenville, Marshall and Brandywine.

Of the Japanese plums, it was reported that the fruit buds were all killed and the ends of some of the canes on young trees.

Training the grape by the one or two arm renewal system was illustrated by a wire fastened to the side of the hall. The principal advantages of the one-arm renewal system (Fig. 1) are: first, simplicity and saving of labor in training and tying up, every part of the vine being easily seen by the operator; second, the fruit and leaves are carried up into the sunlight and air, where they are less subject to the attack of mildew and rot, are out of the reach of poultry, and safe from the spatter of the soil during heavy

showers; third, only two wires are needed, and the labor of pruning is much less than where several arms are employed; fourth, as large a crop of grapes can be grown as with the many-arm system. In Fig. 1 a part of three vines is shown. The upper cane of last season's growth is represented in fruit, while



the new cane is trained on the lower wire. The fruiting spurs are pinched off as soon as the first leaf is found beyond the last bunch of blossoms, and whenever new shoots start from these laterals one leaf is allowed to grow. The laterals on the new canes are treated in the same way, and the end is stopped in growth as soon as it is a foot past the next vine toward which it is growing. At the end of the season the fruited cane is cut away and the new cane from the lower wire is brought to the upper wire for the next season's fruiting.

Girdling grapes to hasten their ripening was explained. Grapes are thus hastened in time of ripening from one week to ten days. It has been practised for fifteen years by Mr. Wheeler of Concord, and is the only way that he can secure his crop from frost in the fall, as his vineyard is only a few feet above the river that flows near.

Remedy for apple maggot or railroad worm, so called: destroy all fallen fruit and pick all marketable fruit before it gets at all mellow.

Cold-storage houses with ice are used by Messrs. Hunt, Eames and others. Drip was prevented by having ice on slats and the water caught on sheet iron underneath. Mr. Hunt used waste water for cooling milk. Mr. Hartwell believed that there was an outlet for all the fine fruit we can grow. Captain Palmer would grow fruit in connection with general farming. The farmer should have a good deal to sell and considerable variety, that his income may be distributed through the year. Would advise young men to plant fruit trees. Use them well and they will use you well. Intends to continue planting, not a few trees each year, but several hundred.

FRIDAY — *Morning Session.*

The closing day began with President Draper in the chair. The report of the committee on gypsy moth resolution was called for, and the following resolutions were presented and adopted:—

Whereas, The committee on agriculture in the Massachusetts Legislature has under consideration the matter of an appropriation for the extermination of the gypsy moth in this State; therefore,

Resolved, That we, members of the Massachusetts Fruit Growers' Association, in annual meeting assembled, earnestly request that a liberal appropriation be made for carrying on the work, that the ravages of this dangerous insect pest be checked.

Resolved, That we recommend that the proper legislative committee be requested to take such measures as will enlist the co-operation of the United States government in this work of exterminating this pest, as we believe it will be a national calamity if allowed to spread over the country.

The speaker for the morning, Mr. C. H. Perkins of Newark, N. Y., a man of wide experience in handling the apple crop and in the evaporating and canning business, was then introduced, and discussed in an able manner "The preservation, storing and marketing of fruit." A brief report of this address we copy from the "Worcester Evening Gazette":—

Mr. Perkins said the subject was an immense one, and more than he could present in the time allotted for the discussion. He first considered the question of cold storage, basing his remarks upon an experience of thirty years in this line of agriculture. He would not be understood as referring to the large cold-storage houses, where fifty thousand bushels of pears were kept for canning, but rather the neighborhood cold storage, the co-operative plan. The advantage to be gained by co-operative cold storage was to preserve the trade, for the Canadian shippers stood ready to monopolize that trade if they saw an opportunity.

He spoke of the extensive apple orchards of the country and of the great demand from European markets. The value of the evaporation was demonstrated from a financial standpoint when the speaker said that in one county in New York State of not more than fifteen towns the value of the product was fully one million dollars. He told of a frost-proof storage house that he had built to store ten thousand barrels of apples. When oranges were sold at a cent apiece, the cry was heard that it would be no use to raise apples. As a matter of fact, apples still sell for more than oranges, not only in this country, but in Europe.

Considering evaporated apples, the speaker exhibited a number of specimens. An evaporating plant varies in expense, as there are many kinds of evaporators. Those costing from fifty dollars to one hundred and seventy-five dollars will evaporate fifty bushels a day; those costing one hundred and seventy-five dollars to two hundred and fifty dollars, from one hundred to one hundred and fifty bushels a day; and those costing three hundred dollars will evaporate one hundred and fifty bushels a day. There are machines that cost eight hundred dollars that operate by steam, with a capacity of two hundred bushels a day. The cost of evaporating is from one and one-quarter to one and one-half cents a pound.

He said that for canning a better grade of apples was used than for evaporating purposes. The profit, however, was great, and in this line of goods Great Britain takes twenty thousand dozen annually. These canned goods find their way on the continent also. There was equally as good profit in canned pears. New England Bartlett pears have the best flavor and are in greater demand. In canning, the apples are cored and quartered, placed in the gallon can, and water is put in. The can is sealed and placed in a tub or vat and boiled. One and one-half bushels of apples will make twelve gallon cans. For canning, the speaker preferred the Baldwin.

He said that the wastes from the evaporators were used to make the cheap jellies, and, strange to say, from apples, strawberry, raspberry and other jellies were made, simply by using the flavor of the fruit desired. He said that this was not so bad as it is in England, where turnips form the basis, instead of apples.

The cold-storage house described by Mr. Perkins (Fig. 2) is a frame building on a solid foundation, the first posts being four inches thick and fourteen feet high. This is covered with paper and sheathing boards. Four-inch studs are again set up on both sides of this wall, and covered with paper and sheathing, thus making a wall about sixteen inches thick, with three four-inch air spaces (as shown at *A*). If desired to make this building more ornamental, clapboards may be put outside, thus adding another thickness of paper and sheathing. The roof is built in the same manner, with three four-inch air spaces and a ventilator, and double glass windows (*B*) on the ridge for light and ventilation. One or more double doors may be provided. Any common frame building could be utilized in this way, by covering both sides of the frame and putting up studs outside and inside of this covering and sheathing up. The foundation should be firm, and below the action of frost outside. This house, after the temperature has

been lowered by opening the ventilators in the roof and the doors near the ground at night and closing in the morning, will scarcely vary in temperature twelve degrees during the fall and winter months. In such a house, cider apples, the poorer two grades used for evaporating and the best two grades used for canning are kept with little or no loss until they can be converted into marketable products. Mr. Perkins made the point very clear that the great advantage of utilizing the seconds and medium grades of apples for canning and evaporating is that the choice apples only

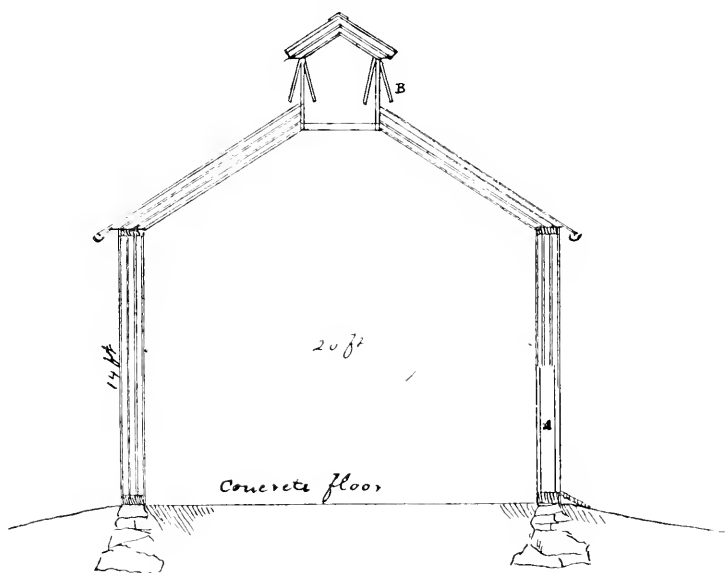


Fig. 2.

are put on the market, and such choice fruit will sell for more than enough above the ordinary grades to pay the cost of working up the former into marketable products. This gain in price of choice fruit should be permanent, on the principle that the more such fruit the people have the more they want, and both demand and prices are increased.

Afternoon Session.

Vice-President Hartwell was in the chair. The address was made by Prof. S. T. Maynard of the Massachusetts Agricultural College, on the propagation, growth and pruning of fruit trees, illustrated by samples of seedling stocks used for budding, etc., the different methods of grafting, by trees as they come from

the nursery, showing No. 1 and No. 2 trees, June-budded and autumn-budded peach trees, one and two year old grape vines, currants, etc. The various methods of propagation and training from the seed to time for planting in orchards were described in detail. The young trees were pruned for planting, and the subject of pruning trees in the orchard up to two or three years of age was discussed by the speaker; when he called upon Prof. J. W. Clark to discuss the best methods of pruning trees, in which he had become very skilful by the care of the largest apple orchard in this State.

The principal reason why this subject was presented is that there is not a single nursery in the State where the fruit trees sold are largely grown by the nurseryman selling them; and there seems to be a field for young and enthusiastic men in supplying from our own soil more of the immense quantity of trees that are planted every year. In every village and hamlet the nursery agent from distant nurseries comes annually without fail, with his highly colored plates of fruits, wonderfully superior to anything ever before seen; and hundreds of thousands of trees and shrubs are sold to our people that might be grown on our own soil, where they could be delivered to the planter in a condition that would make their growth and perfection, with a fair amount of care and skill, a certainty. In almost every large town or city is to be found the local nurseryman, who supplies such local trade as he can secure; but the greater part of his stock, too, is first grown in some New York or other distant nursery, and these, after a year or two of growth in the local nursery, are sold as home-grown stock. Such trees are more valuable than those generally supplied by the travelling agent, and give good satisfaction, but they are far less valuable than well-grown trees planted and budded within an hour's ride of the land on which they are to be planted. These facts led the writer to present this subject at the winter meeting, in the hope that many young men — for there is room for considerable competition in the business — might become interested in the work which, with its many trials, has a great fascination for the true lover of horticulture, and might prove a source of large profit and of great benefit to the fruit growers of the State.

To further this interest, the Agricultural College now offers an elective course of study in nursery work to the members of the senior class, and a short winter course is to be open to young and old the coming winter, where any one who wishes may take up the study of any line of horticulture, including special work in nursery and orcharding. With an equipment of the largest collection of

varieties of fruit to be found connected with any agricultural college in the country ; all of the labor-saving implements for cultivation, pruning, spraying, etc. ; a nursery in which are found all kinds of fruits and ornamental trees and shrubs ; and with no tuition, only the expense of board and incidentals, — no young man, who has the time and is interested in any line of agriculture or horticulture, can afford to let another season pass by without taking advantage of this offer of a free education that shall fit him for some line of the most interesting and healthful, and, when conducted in a business-like way, profitable, calling.

At this, the first annual meeting, forty-seven new names were added to the membership. The meeting was declared adjourned, subject to call for a field meeting in June, at some place to be decided upon in the near future.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF JUNE, 1896.

ISSUED BY

WM. R. SESSIONS

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF JUNE, 1896.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., July 1, 1896.

Bulletin No. 2, Crop Report for the month of June, is herewith presented. Particular attention is called to "The grass crop," a special article by the chemist to the Board, Dr. C. A. Goessmann, which is printed at the close of the bulletin.

PROGRESS OF THE SEASON.

Report No. 138 (June, 1896) of the Statistician of the United States Department of Agriculture gives the total area of winter wheat as 22,794,000 acres. There has been some diminution of area, owing to the total failure of the crop in some sections, the ground being ploughed up for spring wheat or oats. The total area of spring wheat is given as 11,825,000 acres, as against 11,438,000 last year; total acreage 34,619,000 acres, against 34,047,000 last year. The condition of winter wheat has fallen off 4.8 points, being 77.9, against 82.7 May 1. The average condition of spring wheat is 99.9, against 97.8 in 1895. The percentage of the combined spring and winter acreage is 101.7 and the condition of all wheat is 87.6.

The preliminary report places the acreage of rye at 96.9, last year's acreage. The condition is given as 85.2, as against 85.7 last June. Where the condition is low the reasons given are mostly winter-killing and drought. The acreage of oats is 98.9 per cent of that of last year. The greatest oat-producing State, Iowa, has an acreage of 97. The crop has a condition of 98.8, against 84.3 last year at this time and 87 in 1894. There is some complaint of chinch bugs and spring drought, but on the whole the crop is a promising one. The acreage of barley is 89.9 per

cent of last year's area and the condition stands at 98. In California, which produces one-fourth of the crop, the acreage is 98 and the condition is 107.

Returns show a decrease of nearly 5 per cent in the area of clover. The loss is heaviest in the Middle States, the Ohio valley and in Michigan and Wisconsin. The principal cause is drought during 1895, aided by the subsequent and consequent winterkilling. Conditions are high where the acreage has been maintained and lower where it has decreased, this following naturally in the line of the cause of decrease. The average condition for the country is 88.4, against 82.8 on June 1, 1895.

Spring pastures have improved since May, the percentage of condition advancing from 93.2 to 94.5. Comparatively low condition is indicated in the Eastern, Middle and South Atlantic States, and in Kentucky, Tennessee and California; elsewhere the condition is generally very satisfactory.

Apples are generally much below the normal in condition, the average being 71. In New England and other northern sections the condition is generally high, as it is also in the Pacific States. Much complaint is made of damage to fruit from the heavy winds and rain storms of May. Insect pests, particularly the canker worm, are especially abundant. Another cause of low condition is the overcrop of 1895. In the Ohio and Mississippi valleys apples are dropping badly. Where conditions are good there was generally a short crop in 1895.

The principal peach-producing States, Delaware, Maryland, Ohio, Michigan and California, have prospects of an excellent crop. Conditions are very much lower in New Jersey and still lower in Virginia and Georgia. The general average for the country at large is 64.7.

The general average of acreage for cotton is given as 116.2, or 1.4 per cent over the May statement. The general average condition is 97.2. Considerable improvement has been made during the month. First plantings seem to be doing much better than later ones. The present condition, taken as a whole, is unusually favorable for this season of the year.

In Massachusetts the acreage of rye compared with last year is given as 96 and the average condition June 1 as 87;

the acreage of oats as 100 and the condition as 96; the acreage of barley as 100 and the condition as 96; the acreage of clover as 103 and the condition as 91; the average condition of spring pasture as 93; the average condition of apples as 103 and of peaches as 39.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES WEATHER-CROP BULLETINS.]

Week ending June 1. — Throughout the Southern States and generally along the Atlantic coast the week was warmer than usual. Conditions were nearly normal in the central valleys, with a slight deficiency in the lake region. In the central plateau and Pacific coast districts the week was the first week of excessive temperature since April 1. The extremes of temperature were not generally marked. More than the usual amount of rain fell in the central Mississippi, lower Missouri and lower Ohio valleys, over New England and portions of the lake region, south Atlantic and east gulf States. From the upper lake region westward to the north Pacific coast the rainfall was less than average. No rain fell over Texas and Louisiana. Elsewhere conditions were nearly normal. The week was generally favorable. Corn planting is now practically finished and in the central corn belt it has made a rapid growth. Winter wheat harvest is beginning in central sections. Spring wheat seeding has finished in North Dakota, but some remains in extreme northern Minnesota. Cotton has generally made good progress. Week exceptionally favorable for transplanting tobacco.

Week ending June 8. — Week warmer than usual in all districts east of the Rocky Mountains except over limited areas, the excess ranging from 3 to 9 daily. On the Pacific coast the week was cooler than usual. The minimum temperatures were not unusually low, but the maximum temperatures were exceptionally high. The principal agricultural States received ample rainfall, though less than usual fell over portions of the Ohio valley, middle Atlantic States and New England. No appreciable rain fell in Texas. The seasonal rainfall is largely in excess on the Pacific coast, in the Missouri and Mississippi valleys and the greater part of the

lake region. Elsewhere it is generally deficient. The week was generally favorable except where too much rain fell. In the great corn States warmer weather, with sunshine, is much needed. Winter wheat harvest is now in progress. Owing to excessive rains, cotton is becoming grassy. Tobacco is doing well. Light frosts occurred on the 2d and 3d, causing practically no damage.

Week ending June 15. — Week cooler than usual throughout the central valleys and eastward to the coast. Cooler than usual on the north Pacific coast, but on the south Pacific coast and throughout the plateau regions and eastern Rocky Mountain slope warmer than usual. Generally throughout the Atlantic coast districts and over a few limited areas in the lake region and central valleys the rainfall was above the average. Throughout almost the entire Mississippi and Missouri valleys there was a deficiency, and over extensive areas only light showers fell. In the plateau regions and in California no appreciable amount fell. The week has been favorable for the cultivation of crops, though the nights have been too cool for some. In the central belt corn is in a very satisfactory condition, but is backward in the north. Cool weather has checked the growth of cotton. The oat crop is generally reported as doing well. Tobacco planting has progressed favorably and is nearing completion. Stock ranges in south-western sections are in poor condition, owing to drought.

Week ending June 22. — Week warmer than usual throughout the country, except in the south Atlantic and east Gulf States and over limited areas on the immediate Pacific coast. Over much the greater part of the country the week was drier than usual, there being an excess of rain only in limited areas. The seasonal temperature is above the average in nearly all districts east of the Rocky Mountains. On the Pacific coast it is decidedly deficient. The seasonal precipitation is largely deficient over the greater part of the Ohio valley, South Atlantic and gulf States. In New England it is less than 75 per cent of the average. In the upper Mississippi and Missouri valleys and on the Pacific coast it is largely in excess. Favorable weather conditions have continued, corn has made good progress and the har-

vesting of winter wheat is well advanced. Cotton is generally looking well. Tobacco is in a satisfactory condition.

Week ending June 29. — Week cooler than usual over the eastern Rocky Mountain slope, on the California coast, in the Middle Atlantic States, and over portions of the upper Ohio valley and lake region. On the north Pacific coast, throughout the plateau districts, over the northern portion of the upper lake region and throughout the Southern States week warmer than usual. The temperature extremes were not unusual. Rainfall greater than usual in Arkansas, Oklahoma, eastern Kansas, Missouri and the Ohio valley; also over limited areas throughout the country. In the upper Missouri valley and over portions of the upper Mississippi valley, lake region, northern New England and the east Gulf States rainfall less than usual. Week exceptionally favorable for the growth of most crops. Corn has made exceptional progress during the week. Cotton has improved in eastern districts, but continues to suffer from drought in the west. Tobacco is in excellent condition.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending June 1. — New England. Boston: Crops all greatly benefited by abundant rains; from two to three inches have fallen over all central New England; much re-planting necessary, due to drought and insect pests; tobacco setting going on.

Week ending June 8. — New England. Boston: Weather favorable; crops much improved; on some old and dry fields in south grass has not been greatly helped by rain, but generally grass and grain are growing fast; tobacco setting well along; fruit prospects continue excellent.

Week ending June 15. — New England. Boston: Cool and cloudy, with heavy rainfall; grass greatly improved, except on some old fields where too fully matured; too cool for corn, but most crops growing well; tobacco nearly set; hoeing begun, but delayed by wet weather.

Week ending June 22. — New England. Boston: Moist ground, light showers, high temperature and much sunshine

furnished ideal crop conditions; corn is still backward in north, but generally all crops in satisfactory condition; hoeing being rapidly pushed; small fruits very promising.

Week ending June 29. — New England. Boston: Cloudy, with showers in south; little rain and much sunshine in north; grass on rich fields and meadows still improving; early vegetables very fine; potatoes doing well; corn backward, but growing fast; tobacco in good condition; blueberries ripening and promise a large crop.

MASSACHUSETTS WEATHER FOR JUNE, 1896.

The month of June has given nearly normal weather conditions over the greater part of the State. At Boston the accumulative excess in temperature for the month amounts to only 12 degrees, while the deficiency in precipitation is about one-fourth inch. Many of the nights have been too cool for the best growth of corn and like crops, but no damaging frosts have occurred, and the occasional cool weather has been a benefit to fruit and potatoes. High temperatures have prevailed, but there has been no excessive heat.

Moderate showers have been fairly well distributed, and with the soaking general rain on the 14th, the ground has been kept in good condition as far as moisture is concerned. At the end of the month, however, the top of the soil is getting dry in all central and western counties, and rain will soon be needed. Grass on rich fields and meadows is fast recovering from the drought of last month, but on old fields it was too nearly matured and is very light.

Except the storm along the coast on the 14th, there have been practically no damaging winds or local storms to injure the fruit, and the prospect of a full crop is very encouraging. Apples are dropping off some in the east because of the earlier dry weather, but they are reported to be hanging on very well in western counties.

In the circular to correspondents returnable June 25, the following questions were asked:—

1. What insects are doing the most damage in your locality?

2. How is Indian corn looking, and what is the acreage as compared with previous years?

3. How is haying progressing, and what is the prospect for the crop?

4. How does the acreage of early potatoes compare with previous years, and do they promise a full average crop?

5. How have early market-garden crops compared in yield and price with former years, and what is the prospect for those not yet harvested?

6. How do dairy products compare in quantity and price with former years, and what is the condition of dairy stock as regards health?

7. What is the condition of pasturage in your vicinity?

8. What is the outlook for such fruits and berries as are grown for market in your locality, naming them?

Returns have been received from 139 correspondents, and from these the following summary has been made up:—

INSECTS.

The potato bug is the insect most frequently mentioned as doing damage, but it does not appear to be any more plentiful than usual nor are its ravages spoken of as particularly serious. Cut worms are, on the other hand, unusually prevalent and have done much damage, particularly on the tobacco fields of the Connecticut valley. In other sections of the State they have worked in gardens and among vines, in some cases necessitating replanting. They seem to be prevalent in all sections. The small striped squash bug is also reported as doing considerable damage to vines. Canker worms have done much damage in some sections but are now through working for the season. Other insects mentioned are currant worms, white grubs, wire worms, the elm tree leaf beetle, onion maggots, grasshoppers, spittle insects, cabbage worms, rose bugs, the curculio, cranberry vine and fire worms and the corn worm.

INDIAN CORN.

The acreage of Indian corn for the State at large is about that of former years, the reports of increased and decreased acreage balancing each other. However, it is noticeable that

a majority of the reports of increased acreage come from western sections, while a majority of those of decreased acreage come from south-eastern sections. There appears to be an increase in the acreage of fodder and ensilage corn, due probably to anticipation of a short hay crop. The drought of May made the crop late in coming up and the cool nights have retarded growth, so that corn is now backward, but otherwise looking well. Stand and color are generally reported good, though there are some few cases of complaint of poor and uneven germination. Warm nights are now needed to bring the crop forward.

THE HAY CROP.

At the time of making returns haying was hardly begun except in some few localities. Many correspondents reported that nothing had yet been done, while most of the others spoke of it as just commenced. That cut thus far has been secured in good condition. The rains of late May and early June have greatly benefited grass and the hay crop will be much better than was anticipated a month ago. It must, nevertheless, be light, and the great majority of correspondents so report it. Only twelve speak of the crop as good and fifteen as average.

EARLY POTATOES.

There is a considerable decrease reported in the acreage of early potatoes. This is probably due to the low prices which prevailed last year. The crop is generally reported as looking well and the prospect is now good for a full average crop. Practically the only complaint is of unevenness in coming up, and this is by no means general.

MARKET-GARDEN CROPS.

The yield of early market-garden crops was generally good, though there is some complaint of injury from drought and cold. Prices have certainly not advanced even if they have held their own, which, on the whole, is doubtful. The prospect for late crops is almost unanimously reported as good. The correspondent for Arlington says, "Crops good, prices better than last year, good prospect."

DAIRY PRODUCTS.

The quantity of dairy products is about the same as usual, but the decrease in prices noted last year still continues. This decrease is general and confined to no particular section, though felt first and most severely in the dairy districts. The price of milk thus far remains nearly the same, the falling off being principally in the price of butter. Several correspondents say that butter has never been so low in their remembrance. The health and condition of dairy stock is universally reported as good.

PASTURAGE.

The rains have done much to improve pasturage so that now a majority of the correspondents speak of it as in good condition. Very few refer to it as poor. It is probable, however, that this condition is largely dependent on a continued plentiful supply of rain, most pastures being in no condition to sustain a drought.

FRUITS AND BERRIES.

Strawberries were generally a large crop, of fine quality, with prices average. There is considerable complaint of raspberries winterkilling, but where they wintered well the crop will be good. Blackberries, currants and gooseberries promise well. Apples have not dropped to any unusual degree and at the present time a good average crop at least is promised. As indicated in the May report few pears set and fewer still will be harvested. Plums and cherries will also generally be light crops. The peach crop is almost a total failure. Cranberries blossomed fully and promise a good crop. Wild berries, particularly blueberries and huckleberries, give promise of making an abundant yield.

NOTES OF CORRESPONDENTS.

(Returned to us June 25.)

BERKSHIRE COUNTY.

Egremont (J. H. ROWLEY). — Currant worms are doing some damage. Corn is looking well, stand good but small, acreage larger than usual. Haying has not commenced; crop about as in the two past years. Acreage of early potatoes less than usual but an average crop indicated. Dairy products are fully up to the average of recent years in quantity and price; dairy stock in good condition. Pastures are in fair condition, being much improved by the rains. The outlook for fruits and berries is about average.

Alford (L. T. OSBORNE). — There is no particular trouble from insects. Corn is standing well and the acreage is increased one-fourth. Haying hardly begun; not more than two-thirds of a crop, on account of dry weather. Acreage of early potatoes about as usual and promise of a full average crop. Prices of dairy products a little lower than last year; health of stock good. Dry weather has prevented root growth in pastures and the condition is not more than two-thirds of the normal. Apples promise to be about half of a full crop; hardly any pears and cherries.

Richmond (T. B. SALMON). — Potato bugs and a small black fly are doing some damage. Indian corn is in very good condition; acreage 90 per cent of former years. Very few have begun haying; 75 per cent of a full crop will be cut. No market-garden crops raised. Dairy products are fully up to the average in quantity and price, and stock is in good health. Pasturage is in better condition than last month as rain has made feed and kept it green. Strawberries are a good crop; raspberries winterkilled badly and will not be more than half a crop; blackberries good.

Hinsdale (S. M. RAYMOND). — Potato bugs are doing some damage. Corn is backward but the acreage is about as usual. Haying has not commenced but the crop looks better than last year. The acreage of early potatoes is much less than in former years but the crop looks well. Dairy products compare well with former years in quantity, price lower; health of stock good.

Savoy (W. W. BURNETT). — Potato beetles and squash bugs are doing some damage. Corn is quite average though a little behind last year; acreage greater than usual. Haying has not yet commenced; prospect for a light crop. The acreage of early potatoes is fully as great as in former years and we hope for an average crop. Gardens are looking fairly well; not much done for market. Dairy products more than average in quantity, with reduced price; cows in good condition. Pastures are doing fairly well as the rains have started them. The outlook for fruits is not good. Wild berries promise well. Hoeing is progressing well.

Florida (E. D. RICE). — No damage worth mentioning from insects. Many fields of corn had to be replanted but where it came up well it is looking well. Haying is progressing finely and the crop will be an average one. Acreage of early potatoes about as usual and a full crop promised. Cows are doing well and are in good health. There is an abundance of feed in the pastures. Wild strawberries very plenty; blueberries and huckleberries loaded full; blackberries never blossomed fuller.

FRANKLIN COUNTY.

Charlemont (H. S. GILES). — Currant worms, cut worms and potato bugs are all doing damage. Indian corn is looking nicely but is not as forward as in some years. Haying is progressing slowly, with quite favorable prospects. Acreage of early potatoes about as usual and it now appears as though there would be a good crop. Market gardens are looking well and prices are about as usual. Quantity of dairy products a full average and prices about the same; health of stock good. Late rains have improved pasture feed.

Gill (F. F. STOUGHTON). — Indian corn is later than usual; acreage a full average. Haying has just commenced, with the prospect of a good crop. Fewer early potatoes are raised this year than usual. Dairy products are average in quantity but prices have been low. Pasturage is in good condition. Apples promise a good crop; few pears; strawberries winterkilled some, and very many raspberries winter or spring killed.

Deerfield (CHAS. JONES). — Potato bugs are doing some damage. Acreage of Indian corn about average and it is looking well though late. Not much haying has been done and it is not an average crop. Early potatoes have a good average acreage, and promise a full crop. Dairy products are about as usual in quantity and price, and the health of stock is very good. Pasturage is not quite up

to average condition. Strawberries are doing well; apples a short crop; not many pears and peaches. Tobacco is all set and some is early and looking well.

Northfield (T. R. CALLENDAR).—Striped bugs in cucumbers and squashes have done the most damage of any insect, though cut worms have been very troublesome in tobacco fields. Corn is looking well; acreage fully as large as last year, with more fodder corn sown. Only a few acres of grass have been cut but the prospect is much better than last year. About the usual amount of early potatoes were planted and they are looking unusually well. Market-garden crops are very little grown; prices about the same as last year. Quantity of dairy products fully up to the average but prices lower than for many years; stock in good health. Pasturage has hardly recovered from the drought of the past two years but looks fairly well. Strawberries were a good yield, but prices were rather low; other small fruits set well.

Sunderland (J. M. J. LEGATE).—Cut worms are doing some damage, particularly in tobacco fields. Corn is looking very well, with an average acreage. Haying has hardly begun and there will not be more than half a crop. Not so many early potatoes have been planted as last year but they are looking well. The quantity and price of dairy products is about the same as usual, and the health of stock is good. Pastures are looking well. Apples are looking well; no peaches and very few pears. There has been a heavy crop of strawberries, but prices have been very low.

Orange (ANSEL HARRINGTON).—Cut worms, squash bugs and potato bugs are quite troublesome. Corn is rather backward but looking fairly well; acreage above previous years. Very little haying has been done as yet but the crop promises to be above the average. The acreage of early potatoes is below previous years but they promise fairly well. Early market-garden crops are below former years in yield and price. Pasturage is in fairly good condition. Quantity of dairy products above former years, price lower; stock in good condition. A good yield of strawberries; raspberries, blueberries and blackberries promise well.

HAMPSHIRE COUNTY.

Greenwich (WM. S. DOUGLAS).—Potato bugs are doing some damage. Indian corn is looking well though small; acreage about the same. Not much haying done yet and prospect of a light crop. Acreage of early potatoes about as usual and they are looking well. Not much market gardening in this town. Dairy

products are quite up to former years in quantity and price. Pasturage is in good condition. There was a splendid crop of strawberries.

Belchertown (H. C. WEST). — Little complaint of insects, though there are some squash bugs and potato beetles. Acreage of corn fully up to former years and looking well. Very little hay cut as yet; prospect fair and crop good on moist ground. Full average acreage or more of early potatoes and they are looking well. Quantity of dairy products fully up; prices lower than for years; cows looking well. Pastures have improved wonderfully since the rains. Apples, pears and peaches are below the average, but berries of all kinds bid fair to be a full crop.

North Hadley (H. C. RUSSELL). — Cut worms are hard at work on all crops. Very few insects attacking fruit trees. Corn is looking well and the acreage is about the same as usual. No haying done yet; grass will be light but has improved in the last three weeks. Early potatoes look well; no larger acreage than usual. Yield of early market-garden crops good; prices as usual. Full amount of dairy products but price lower than for several years. Pastures have not fully recovered from the early drought. Apples promise an average crop; large crop of strawberries and very nice.

Southampton (C. B. LYMAN). — White grubs, cut worms and potato bugs are all doing damage. Indian corn is looking fairly well and the acreage is fully up to former years. Haying has just commenced and the crop will be below the average. Acreage of early potatoes fully average, but the condition is off at present. Quantity of dairy products fully average; price from two to four cents less; stock looking well. Pasturage is hardly average in condition. Apples have not set well and the crop will be hardly an average for an even year.

Williamsburg (F. C. RICHARDS). — Cut worms in gardens cause some trouble; fruit insects are not troublesome. Corn is backward but the acreage is about as formerly. Haying has not fairly begun and the prospect is for a short crop. Dairy stock is in a healthy condition. Pasturage is in poor condition but is improving under the recent rains. Strawberries and raspberries good; very few quinces; very few pears; no cherries; no peaches; apples good. Grass is thickening up at the bottom but not enough to insure a good crop.

Chesterfield (HORATIO BISBEE). — Corn is looking well, but I think there is not so much planted as last year. Haying not commenced and prospects for the crop rather poor. Early potatoes are about the same acreage as last year and are looking well.

Quantity of dairy products about as usual; price lower; cows in good condition as regards health. Pastures are in fine condition since the frequent rains. No fruit or berries raised here for market.

HAMPDEN COUNTY.

Granville (JOSEPH WELCH). — Cut worms and squash bugs are doing some damage. Corn looks well; acreage about the same as last year. Haying has not commenced and there will not be more than half a crop. Early potatoes are not raised here. Butter is very low; stock is healthy and looking well. Pastures are now looking well, but have been very short. There has been quite a crop of strawberries, and the prospect is that there will be a large crop of high and low blueberries.

Chicopee (R. W. BEMIS). — The canker worm is the only insect now doing damage. Corn is looking well; acreage about as last year. Not many have commenced haying on account of wet weather. Early potatoes look well and promise a good crop. There has been an extra quantity of milk and butter on the market and prices are low. Pasturage is in good condition. Strawberries have been plenty; cherries a small crop; apples dropping badly, and pears a very small crop.

Monson (A. H. WHITE). — Cut worms are plenty and potato bugs are too plenty. Indian corn is backward, with a large acreage. Very few have commenced haying; crop looks fairly well on moist land. The acreage of early potatoes is less than usual and they have not come up very well. Dairy products equal to the average in quantity, but less in price; cows looking quite well. Pastures have improved since the rains. Strawberries have done fairly well; apples have dropped some but will be a fair crop.

Holland (WM. S. WALLIS). — Squash bugs are doing some damage. Corn is looking fairly well though two weeks later than usual; some complaint of its not coming up well. No haying done yet and a light crop expected. Potatoes are looking finely and the bugs are not as plenty as usual. Dairy products fully average in quantity and price; stock looking well and no disease. Pasturage is in fair condition though it did not start as early as usual. Fair prospect for an average crop of apples; not many pears and cherries.

Russell (E. D. PARKS). — Potato bugs are doing the most injury of any insect. Indian corn is looking very good, with about the usual acreage. Haying has just commenced, with better prospects, so that the crop should be two-thirds of the normal. Good acreage of early potatoes, just blossoming and looking finely. Dairy prod-

ucts are about the same as usual in quantity and price, and stock is unusually healthy. Pastures are in very good condition. Apples promise very well, and the prospect is fair for blackberries and blueberries.

WORCESTER COUNTY.

New Braintree (C. D. SAGE). — Very little damage from insects now. Corn has not come up well in many fields and the acreage is a little less than last year. Very little haying done yet; crop light but improving. Acreage of early potatoes much less than usual; the early planted ones look well; later ones did not come up well and the crop will be small. Quantity of dairy products same as usual; price of butter very low and that of milk lower than usual. Pasturage is in fair condition, having improved much since the rains. Apples promise well.

Dana (E. A. ALBEE). — Cut worms are doing some damage. The acreage of corn is 25 per cent below the average; looking well. Haying has not commenced but there will be a good average crop. The acreage of early potatoes is less than that of last year; they are looking well at present. Early market-garden crops are about as usual in yield and price, and the prospect is good for later ones. Milk the same price but butter 5 cents a pound lower than usual; no disease here. Pastures are in good condition. Strawberries were more than an average crop, and currants about as usual.

Royalston (A. J. RAYMOND). — The potato bug is the only insect doing damage. Indian corn is rather backward; acreage twice as much as in other years. Haying has not yet begun and the crop will not be quite an average one. Very few early potatoes planted but they are looking well. Quantity of dairy products about as usual; prices lower; stock all healthy. Pastures are rather dry and there are some grasshoppers. Strawberries a good crop; blackberries and blueberries promise well.

Templeton (LUCIEN GOVE). — Cut worms, potato bugs and small squash bugs are doing damage. Corn is quite backward, having to be replanted in some instances; acreage larger than usual. A few have commenced haying; crop the lightest for years. Acreage of early potatoes rather less than last season but the prospect is good. Early market-garden crops are a fair average in yield and price; later ones not so good. Quantity of dairy products a fair average; price of milk good; butter the lowest for thirty-five years; health of stock good. Recent rains have brought pastures up to the normal condition. Full crop of apples; pears light; no

peaches, cherries or plums; strawberries fair; currants, raspberries, blueberries and blackberries good.

Fitchburg (Dr. JABEZ FISHER). — No insects doing much damage. Indian corn is looking unusually well. Early pieces of grass are cut, and yielded more than was expected but are still short of a full crop. Acreage of early potatoes about 80 per cent of the normal and they promise well with sufficient rain. Pasturage is in medium condition but needs more rain. Apples promise 90 per cent of a full crop and pears 40 per cent; strawberries have done well both as regards yield and price; other berries promising except raspberries, which winterkilled; grapes giving good promise.

Clinton (P. B. SOUTHWICK). — Canker worms, potato bugs and white maggots are doing some damage. Corn is good color and is growing rapidly; acreage about the same as usual. Very little haying done; crop light on old fields but heavy on rich, moist land. Early potatoes have about the usual acreage and are looking well, except that they are uneven. Prices of market-garden crops are lower than previous years. Dairy products are a fair average in quantity and price, and dairy stock is looking very well. Pasturage is looking finely since the rains. Strawberries are plenty and cheap; currants fine; raspberries light and blackberries looking well.

Leicester (L. D. THURSTON). — Corn is looking well and the acreage is about the same as usual. Very few are cutting grass yet but a light crop is expected. Early potatoes have about the usual acreage and are now looking well. Early market-garden crops have been average. Dairy products about the same as usual in quantity and price; stock in better condition. Pastures are in good condition. Strawberries and blueberries are a full crop, and other small fruits will be abundant.

Southborough (E. F. COLLINS). — Potato bugs are doing some damage. Corn is rather backward, and not as much is raised as in previous years. Considerable hay has been cut and the crop will not be quite an average one. Acreage of potatoes about two-thirds that of previous years and crop now in fine condition. Sweet corn looks well but tomatoes are backward. Quantity and price of dairy products about the same as usual. Pasturage in fair condition. Apples looking well where the canker worms were killed; no peaches and but few pears; strawberries not an average crop.

Grafton (S. E. STOWE). — Squash and potato bugs are doing some damage. Corn is a little backward but the warm days are helping it along; acreage fully 100 per cent. But little haying done, and the crop will not be more than 80 per cent of an average. The acreage of early potatoes is reduced one-fourth but they are

looking well. Asparagus and peas made a good yield and sold well. Stock is in excellent health, but prices for dairy products are low on account of surplus. Pasturage in good average condition. Strawberries are not a full crop; raspberries look well, as do blackberries.

Douglas (WM. ABBOTT). — Striped squash bugs and cut worms are doing some damage. The acreage of Indian corn is about the same as last year; looks well but is rather low for the time of year. Very little haying done; crop will be light. Acreage of early potatoes fully as large as usual; promise of a full average crop. Early peas never were better. Dairy products less in quantity and price low; stock is looking well. Pastures are in fair condition, there having been great improvement. The prospect for all kinds of berries is good.

MIDDLESEX COUNTY.

Dunstable (A. J. GILSON). — Potato beetles and squash bugs are numerous. Corn is looking well; acreage less for ripening but greater for the silo. Haying has not commenced but the crop will be lighter than last year. Early potatoes only raised for home use. Dairy products about as for two years past in quantity and price, and the health of stock is generally good. Pastures are in better condition than a month ago. Apple trees are well loaded and the outlook is good. Cultivated berries winterkilled somewhat.

Carlisle (E. J. CARR). — Cut worms are doing some damage. Acreage of Indian corn about as usual; crop looking well but not so large as last year. Only a few have commenced haying, but a good fair crop is expected. Not as many early potatoes were planted as last year but they promise well. The yield of early market-garden crops was hardly average, prices good. Dairy products about the same as usual in quantity and price; stock in better health than formerly. Pasturage is in good condition. Apples and strawberries are in good condition, and blackberries are looking well.

Billerica (J. N. PARDEE). — Cut worms are complained of as unusually destructive. Acreage of corn about as usual, and crop booming, with good color and growing fast. Very little grass cut as yet; it has thickened since the rains and is but little below the average. Acreage of early potatoes less than usual but crop looking well and very promising. Milk has been unusually "flush" so far, with the usual prices. Pasturage is rather better than usual, owing to good rains. Strawberries are abundant and fine; raspberries winterkilled badly; blueberries abundant; pears few; apples abundant and not dropping much.

Woburn (W. H. BARTLETT). — Cut worms, cabbage maggots and potato bugs are the most plentiful insects. Corn is late and poor but improved much the past week. Haying has just begun and there is not over half a crop in general. About the usual acreage of early potatoes and they are now looking very well indeed. Early market-garden crops have been about as usual thus far this season and late ones are looking well. All stock is looking well. Pastures are as good or better than in average years. Strawberries, blackberries and raspberries are average, though raspberries winterkilled some.

Winchester (MARSHALL SYMMES). — Cut worms have done and are still doing much damage. Early sweet corn is just showing tassels; no Indian corn raised. Hay crop light and haying well under way. Rather more ground than usual is planted to early potatoes, but vines are not quite so forward or large as they should be. Early market-garden crops suffered from drought and cold, and prices are not high on anything. Milk sells readily, and all cows appear healthy. Pastures are eaten up clean and cows are mostly fed in the barn. Strawberries were a very good crop. Blueberries more plenty than for years past. Early peas were cleaned up several days earlier than usual, and some fields are planted with a second crop of beets or turnips.

Newton (OTIS PETTEE). — Cut worms, canker worms and currant worms are doing some damage. Haying is progressing very well; crop rather lighter than usual but of good quality. Pasturage has improved since the rains but is not quite up to the average. Strawberries, currants and blackberries are promising a very fair yield but apples are dropping considerably.

Hopkinton (W. V. THOMPSON). — The spittle insect is doing the most damage at present. Corn is looking well with about the usual acreage. Not much haying has been done yet. Acreage of early potatoes less than last year but the crop is looking well. Dairy products are about as in former years in quantity and price. Pasturage is in poor condition. Strawberries a good crop; raspberries winterkilled; blackberries looking well; wild berries will be plenty; apples looking well where the canker worm did not work; currants good; no peaches or pears.

ESSEX COUNTY.

West Newbury (J. C. TARLETON). — Potato bugs are not as plenty as in years past. More corn planted than usual and looking as well as last year. Hay will be below the average crop and none has been cut yet. Not many early potatoes were planted and they

did not come up well. The production of milk is increased this year; cattle healthy and in fine condition. Pastures are in very good condition since the rains. Apples promise a full yield; strawberries ripening very slowly but a good yield; raspberries badly winterkilled; blackberries looking well.

Groveland (ABEL STICKNEY). — Cut worms are doing some damage and potato bugs need looking after. Corn is looking small, but the acreage is increased 10 per cent. No hay cut but prospects quite good. Yield of early market-garden crops average, and prices better than usual; prospects for late crops fair. Dairy products same as formerly in quantity and price; health of stock good. Pastures are doing well at present. The outlook is good for nearly all fruit except pears and peaches.

Ipswich (O. C. SMITH). — Potato bugs and squash bugs are troublesome. Acreage of Indian corn rather more than average; plants small but in healthy condition. Haying just commencing, with two-thirds of an average crop. Acreage of early potatoes about as usual; seed came poorly and the crop will not be average. Prospect for market-garden crops good, but prices low. Stock is looking well; quantity of dairy products same as usual, but prices too low for profit. Pasturage has kept up well and is in fully average condition. Wild berries promise largely; strawberries fair, but ripening slowly; apples a large crop, but pears small.

Hamilton (ALVIN SMITH). — Canker worms, squash bugs and potato bugs are doing some damage. Indian corn is a little late. Haying is commencing, with a light crop. Early potatoes are looking very well. The prospect for market-garden crops is very good. Dairy products are about the same as usual, and stock is healthy. Pasturage is still suffering from the drought in May. Strawberries are looking well, as are other berries.

Wenham (N. P. PERKINS). — Cabbage worms, onion maggots, squash bugs and cut worms are doing some damage. Corn is backward and did not come up well; about the usual amount planted. Haying has commenced on high ground, and the crop will be better than was expected. About the same acreage of potatoes planted and the crop promises finely. Peas brought good prices, but the yield was not large. Pastures are quite poor, but have improved somewhat. Quantity and price of dairy products about as usual. Strawberries are a good crop; currants and gooseberries looking well, and wild berries promising an average crop.

Danvers (C. H. PRESTON). — Corn looks very well, with an average acreage. Haying has just begun and the crop is very light except on wet land. Acreage of early potatoes below the average; some pieces did not come up well, but otherwise a full crop is

promised. No change in quantity or price of dairy products. Pasturage is in fair condition. Strawberries were rather less than an average crop; raspberries winterkilled; blackberries were somewhat weakened by the severe winter, but look fairly well; currants average.

NORFOLK COUNTY.

Millis (E. F. RICHARDSON).—Potato beetles, cut worms, rose bugs and spittle insects are all doing damage. Corn is looking well but with a decreased acreage. Haying commenced early and the crop is very short on high land. Acreage of early potatoes about as usual but they were uneven in coming up. Early market-garden crops were about average in yield and price. Dairy products about average in quantity and price; health of stock good. Pasturage in fair condition. Strawberries are a good crop, and apples promise well.

Medfield (GEO. R. CHASE).—Rose bugs are doing some damage. Acreage of Indian corn 90 per cent of former years and the crop in average condition. Haying has scarcely begun but the crop is about as good as last year. Early potatoes do not promise a full average crop. Yield of early market-garden crops below average and prices low. Quantity of dairy products right; price of butter lower than last year. Pastures are in rather poor condition. Strawberries are a good to large crop.

Canton (B. R. DOODY).—Squash bugs and potato bugs are doing some damage. Very little corn is grown in this locality. Haying is fairly begun and an average crop is being harvested. Potatoes are looking well and the acreage compares favorably with former years. Cattle are in good health. Pastures are in fair condition. Strawberries and currants have been quite largely grown and have been quite successful.

Cohasset (E. E. ELLMS).—Cut worms and potato bugs are doing some damage. Corn is looking well and the acreage is about the same as usual. Haying has not commenced but will be about a three-fourths crop. Acreage of early potatoes about as usual and a full average crop promised. Early market-garden crops have yielded well and prices are good. Dairy products about as usual in quantity and price. Currants, strawberries and raspberries are all good.

BRISTOL COUNTY.

Mansfield (WM. C. WINTER).—Currant worms and curculios have done much damage. Corn is looking well with about the usual acreage. Some hay has been cut and gotten in in good con-

dition; crop average on low ground. Acreage of early potatoes about as usual; they came very unevenly but are looking well since the rains. Early market-garden crops were injured by dry weather in May; crops light; prices low. Quantity of dairy products slightly below the average; price about as last year; stock healthy. Pastures have come up since the rains so that they are now generally good. Currants a full crop; gooseberries and apples the same; pears very light; raspberries, blackberries and huckleberries a full crop; strawberries an average crop, with low prices.

Easton (H. M. THOMPSON). — Potato bugs, squash bugs and cut worms are doing damage. Indian corn is looking well, with about an average acreage. Haying has begun and the crop will be an average one, though grass suffered for want of rain in the early part of the season. The acreage of early potatoes compares favorably with former years and there is promise of a full average crop. Early market-garden crops have been about average in yield and price. Quantity of dairy products same; prices lower; health good. Pastures are in fair condition. Apples promise a heavy yield.

Norton (WM. A. LANE). — Squash bugs and potato beetles are doing some damage. Corn is in fair condition and the acreage is a little more than average. Haying is just beginning, with a two-thirds crop. There is an average acreage and average crop of early potatoes. Dairy products are about average in quantity and price. Pasturage is in good condition just now. There has been a good crop of strawberries.

Taunton (C. H. WILMARTH). — Rose bugs and canker worms are doing some damage. Corn is looking well and the acreage is about as in previous years. Haying is progressing well and the prospect for a large crop is good. Acreage of early potatoes about as usual and they promise a full average crop. Early market-garden crops are about as usual in yield and price and later ones promise well. Dairy products about as usual in quantity and price, and stock is in good health. Pasturage is in better condition than usual. Strawberries a good crop; apples promise well, cherries good, and pears poor.

Dighton (J. N. PAUL). — Indian corn is looking well, acreage about as last year. Haying has not commenced yet but the crop will be very light. The acreage of early potatoes is much below the normal; they came up very unevenly, have grown very poorly and will not be half a crop. Asparagus yielded better than last year and sold well; other market-garden crops about the same as last year. Making milk for city trade is largely on the increase;

stock looks well. Pasturage is in good condition. Apples promise to be a good crop; pears very poor; grapes good; raspberries badly winterkilled. Dighton's strawberry crop is nearly harvested and it has been the best crop for quantity and quality for five years. Prices were good for two weeks but the intense heat of June 20 and 21 softened the berries and since then they have hardly paid expenses. The crop was ready for market the earliest for a number of years, the first shipments being made in May.

Acushnet (M. S. DOUGLAS). — Melons, cucumbers and squashes are being destroyed by cut worms and have to be replanted. Indian corn is looking well, with the acreage smaller than usual. Haying commenced unusually early and there is no crop on old meadows. The acreage of early potatoes is small on account of low prices; good crop promised those who planted. Yield of early market-garden crops good, prices lower than formerly; prospect for later ones good. Dairy products do not change much in any respect. Pasturage is in very good condition at present. Strawberries abundant; raspberries promise well; large quantities of wild berries.

PLYMOUTH COUNTY.

Brockton (DAVIS COPELAND). — Striped squash bugs and cut worms are doing some damage. Indian corn is backward for this time. Haying has not commenced much yet but the crop has been much improved by the rains. The acreage of early potatoes is about 75 per cent of the normal but they are generally looking well. Early market-garden crops fell off one-fourth in yield with average prices. Dairy products not quite up in quality; price the same; health good. Pasturage is in fair condition, being improved by rains. The outlook for apples is good but poor for pears and peaches.

West Bridgewater (F. E. HOWARD). — In answering question 8 for May I had in mind vegetables as well as fruit and consequently gave as my answer 2 to 1. Were I to state now what proportion the production of fruits and small fruits bears to general farming I should say 1 to 5.

Marshfield (J. H. BOURNE). — Potato bugs, grubs and cut worms are doing some damage. Corn is little backward but of good color and gaining; acreage not quite so large as last year. Haying is just commencing but the crop is hardly an average one. Acreage of early potatoes a little larger than usual and crop never more promising in appearance. Asparagus made a good yield but prices went down quickly and are also low for rhubarb. Yield of milk

good ; prices same as usual ; butter low and little made. Pastures are improving. Strawberries are yielding well but prices are low. Wild berries will be plenty.

Halifax (G. W. HAYWARD). — Potato bugs are doing some damage. Corn is backward but the acreage is about the same as formerly. Very little hay cut yet and a fair crop on good meadows. Not so many early potatoes planted as usual ; with favorable weather crop will be fair. Peas are being harvested, with prices better than last year. Dairy products full in quantity ; prices lower than for many years ; health of stock good. Pasturage is in very good condition. Strawberries yielded well ; apples will be a good yield ; grapes look well ; berries will be plenty ; no pears or peaches.

Kingston (J. H. CUSHMAN). — Potato bugs and striped squash bugs are doing damage. Corn is small but of good color and about the usual acreage. There is very little haying done and the crop will be light. Early potatoes are looking well with about the usual acreage planted. Garden crops are late and prices about as usual. Quantity of dairy products large ; prices as usual ; health of stock good. Pastures are looking well. The outlook for fruits is good.

Carver (J. A. VAUGHAN). — Squash bugs are doing some damage. Corn is in good condition though not so much was planted as last year except for fodder. Haying has not begun yet but a medium crop is expected. Acreage of early potatoes less than usual but crop looks well. Late potatoes did not come up well. Early peas are being harvested and are a good crop. More milk is produced than formerly ; health of stock good. Pasturage is in good condition. Strawberries have given a large crop of good fruit ; cranberries are blossoming well and a large crop is promised.

BARNSTABLE COUNTY.

Falmouth (D. R. WICKS). — Potato beetles are worse than ever before. Early planted corn looks well ; sweet corn tasselling out strong. Haying not yet commenced but the prospect is for half a crop. Acreage of early potatoes about as usual and a good crop promised. Early market-garden crops were about the same as usual in yield and price. Dairy products about the same as usual in yield and price, and stock doing well. Pasturage was never in better condition. Strawberries a good crop ; apples good if they do not drop ; pears not plenty ; peaches a fine crop if they stick.

Mashpee (W. F. HAMMOND). — The cut worm, wire worm, fire worm and potato bug are all doing damage. Corn is looking well, with about the same acreage as usual. Hay will be about an aver-

age crop. Early potatoes look quite well and bid fair to be an average crop. Early market-garden crops have been about as usual in yield and price, and the later ones promise well. The quantity and price of dairy products is about as last year, and the health of dairy stock is good. Pasturage is in good condition. Blackberries, raspberries, gooseberries, currants and cranberries are looking well.

Brewster (J. H. CLARK). — The cranberry worm is doing some damage. Indian corn is looking well, with about an average acreage. Haying has not begun yet and the crop will be light. Early potatoes have about the usual acreage and promise well. The yield of early market-garden crops was less than usual; prices the same; prospect for late ones good. Dairy products compare well in quantity and price with former years, and stock is healthy. Pasturage is in very good condition. The outlook for fruits and berries is very good.

Eastham (J. A. CLARK). — There is no particular damage from insects. Very little Indian corn planted here. Haying has hardly commenced as yet. The acreage of early potatoes is average and they promise well. Prices for dairy products are the same as formerly, and stock is healthy. Apples look well. Asparagus is the principal crop marketed at this date. Shipments have not been as large as last season, probably owing to the prevailing east winds a good part of the cutting season. Prices about one-fourth off from last year.

Truro (D. E. PAINE). — Potato bugs are doing some damage. Few have begun to cut hay; crop fair. Early potatoes are backward and not well enough along to pass judgment upon. Early market-garden crops have been good in both yield and price, and later ones promise fairly well. Quantity and price of dairy products about the same as usual, and the health of stock is good. Pastures are now in fair condition. All kinds of fruit will be a short crop.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Potato beetles, squash bugs and cut worms are doing some damage. Indian corn is a little backward, with an average acreage. No haying done as yet and the prospect poor for a large crop. Acreage of early potatoes about average but the promise for a full average crop very doubtful. Dairy products about average in quantity and price; health of stock good. Pasturage is in very good condition. Strawberries are yielding well but the market is dull.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

THE GRASS CROP.

By Dr. C. A. GOESSMANN, Amherst, Mass.

Within a few pages I propose to discuss briefly some of the points which deserve a serious consideration when aiming at a remunerative production of grasses for fodder. A short description of some field experiments with grasses carried on by the writer during a series of years upon the fields of the Massachusetts Agricultural College may serve in some measure as an illustration in the matter.

ADAPTATION OF SOIL.

A successful production of our valuable meadow and pasture grasses depends in a less degree on any particular kind of soil than on a well-regulated, constant supply of moisture. Light, sandy soils are known to furnish good meadows and pastures, provided the necessary amount of moisture and of suitable available plant food is furnished during the entire growing season. A deep loam or mellow clayish loam is, however, considered the typical soil for grass lands. Our best meadows are found as a rule upon lands which contain either a liberal admixture of a fine clayish silt in their original make-up or receive periodical addition of that kind by overflow or otherwise. These materials are usually comparatively rich in various kinds of plant food; they exert in many instances a beneficial effect on the retentive qualities of the soil, as far as moisture and available plant food are concerned; and they tend to protect the root system against extremes of climate and season, by rendering the soil more compact and closed up.

No class of crops is more seriously affected by a periodical access of an excess of water or by exposure to a serious period of dryness than the grasses. A frequent occurrence of these conditions, even for a comparatively short period, during the growing season causes gradually serious changes in the whole character of the growth upon grass lands. A wet condition of the soil due to a high local level of the water in the soil favors the appearance of an inferior class of grasses; stagnant water is destructive to all good grasses; while a continued dryness of the soil favors the appearance of a class of herbaceous plants characteristic to dry pastures. The stated results become in the same degree more marked as these undesirable conditions occur or continue.

Well-devised systems of underdraining or of irrigation are efficient remedies wherever local circumstances admit of an unrestricted judicious management. The growth upon wet lands not capable of underdraining is not unfrequently materially improved by ditching, or by raising the surface of the land with a layer of a light, sandy soil several inches in thickness above the previous level of the ground water. A choice of either one or the other of these modes of improvements or a combination of both depend for obvious reasons on local resources, to accomplish the end in view at a reasonable outlay.

Dry lands unfavorably located for irrigation, or under the influence of adverse climatic conditions, as frequent scarcity of rain during the growing season, offer but little inducement for the cultivation of perennial grasses. The bad effect of short spells of dryness may be somewhat modified by adding the seeds of some valuable broad-leaved fodder plant, for instance, medium red clover or white clover, for the purpose of shading the ground and thereby economizing existing local resources of moisture. Some of our better grasses are less affected by spells of dry weather than others; a due consideration of this fact in selecting among these for cultivation tends to materially improve the chances of success. Meadows and pastures which are in an exceptional degree inclined to a spontaneous growth of an inferior class of fodder plants and weeds, if at all fit for a more thorough system of cultivation, ought to be ploughed up and subsequently for some years planted with some hoed crop or subjected to drill culture, for the purpose of destroying effectually the foul growth and improving the physical and chemical condition of the soil. These lands prove in many instances more profitable when planted with other fodder crops than grasses.

MANURING GRASS LANDS.

Next in importance to a fair degree of special adaptation of the soil for a remunerative production of grasses come the requirements of an efficient supply of available plant food. Grasses are, comparatively speaking, large consumers of plant food. A few numerical statements regarding the grass crop may show in what direction and in what varying quantities the same weight of the crop may consume the different articles of plant food when raised under more or less favorable conditions.

Green grass, at the time of forming seeds (per ton), contains seventy-five per cent moisture and twenty-five per cent vegetable matter : —

Moisture,	1,500.00 pounds.		
Vegetable matter,	500.00 pounds.		
Mineral constituents (in vegetable matter),	36.00 to 44.00 pounds.		
Nitrogen,	8.00 to 14.00	"	(12 cents).
Phosphoric acid,	2.40 to 4.40	"	(4.5 cents).
Potassium oxide,	9.00 to 16.00	"	(4.5 cents).
Calcium oxide,	2.00 to 5.60	"	
Magnesium oxide,80 to 2.40	"	
Sodium oxide,60 to 1.60	"	
Sulphuric acid,	1.60 to 2.00	"	
Chlorine,	2.20 to 4.20	"	
Manurial value,			\$1.38 to \$2.58

Meadow hay (per ton), containing from fourteen to fifteen per cent of moisture : —

Moisture,	280.00 to 300.00 pounds.		
Vegetable matter,	1,700.00 to 1,720.00	"	
Mineral constituents (in vegetable matter),	100.00 to 160.00	"	
Nitrogen,	30.00 to 50.00	"	
Phosphoric acid,	7.00 to 14.00	"	
Potassium oxide,	32.00 to 64.00	"	
Calcium oxide,	6.00 to 20.00	"	
Magnesium oxide,	3.00 to 10.00	"	
Sodium oxide,	2.60 to 6.00	"	
Sulphuric acid,	5.50 to 9.00	"	
Chlorine,	7.50 to 16.00	"	
Manurial value,			\$5.36 to \$10.50

Experience tells us that a liberal manuring pays better than a scant one ; yet, if we should try to restore to the soil from outside sources a corresponding amount of all the fertilizing constituents which the grass crop abstracts, it would make, in most instances,

the remunerative production of the hay crop rather an exception than the rule.

Good economy advises us to manure our lands with a particular reference to special wants. To do this intelligently requires a fair knowledge regarding the following points : —

1. The general character of the soil, the location of the lands, the history of their former treatment as far as the system of manuring is concerned, as well as the kinds of crops which have been previously raised upon them.

2. The quality and relative quantity of the various essential articles of plant food which a satisfactory yield of the contemplated crop requires.

3. The degree of natural fitness of the plant to be raised to avail itself not only of the atmospheric plant food, but also of the existing inherent amount of plant food in the soil to be used for its production. The development of their root and leaf system, as well as the shorter or longer period of time required for their growth, deserves a most serious consideration in this connection.

Perennial plants are as a rule better qualified to benefit by existing and inherent resources of plant food of the air and the soil. Our best meadow grasses are perennials. Their long period of growth, supported by a liberal development of leaves and roots, enables them to benefit in an exceptionally high degree by the inherent resources of plant food of the soil engaged in their production and of the atmosphere. They are for this reason less exacting, as far as an additional supply of plant food is concerned; and they can be raised upon a naturally good soil, fit for grass production, at a less expense for manure than the majority of general farm crops. This fact, however, ought not to lead to the belief that manuring grass lands is not profitable in the majority of cases; for permanent grass lands, meadows and pastures which produce to-day remunerative crops without the assistance of manure of some kind or other from outside sources are rather the exception than the rule. The unsatisfactory condition reported of the majority of our grass lands has to be largely ascribed to the prevalence of an indifferent system of manuring them.

The cultivation of one and the same crop or class of crops year after year upon the same lands without some rational mode of manuring cannot fail to change gradually but surely the mechanical as well as chemical character of the soil for the better or the worse, as far as that crop or class of crops is concerned, — in the majority of cases for the worse.

A reliable general fertilizer for grass lands has to be compounded on the same rules which are recognized as rational with reference

to other farm crops; *i.e.*, it ought to provide for the return of those essential articles of plant food which the grass crop in an exceptional degree has removed from the soil upon which it has been raised. It is to be remembered that wherever the grass crop is still the main source of coarse fodder for farm live stock the product of the fertility of grass lands is constantly turned to account for the improvement of the lands used for the cultivation of other farm crops. This once universal practice of manuring farm lands has ceased to be advisable or even excusable, since a well-developed trade in commercial fertilizers provides amply the needed remedy, — more manure. Its ruinous influence on the original productiveness of the farm lands in all civilized countries, ours not excepted, wherever important farm products, as grains, etc., have been largely sent to market without any return of the plant food they contained, is fully recognized.

The grass crop contains on an average one part of phosphoric acid to four of potash and three of nitrogen. In case of newly laid down grass lands it is well to adhere to that proportion. In case of old grass lands with an abundance of vegetable decayed matter the amount of nitrogen may be safely reduced one-half. It is not possible to state more definitely the exact amount of nitrogen, phosphoric acid and potash which will secure the best results, on account of the widely varying condition of grass lands as far as their state of fertility is concerned. Taking two tons of hay as an average yield per acre as the basis, from twenty to twenty-five pounds of available phosphoric acid, one hundred pounds of available potassium oxide, with thirty pounds of available nitrogen per acre, would fairly meet the average condition. This fertilizer can be secured to-day at about from eight to nine dollars in the best form for immediate action. It is not advisable to reduce the nitrogen in our grass manures to too small quantities, for the best grass crops contain the largest amount of valuable nitrogen compounds.

No single article of plant food acts independently of the rest; a liberal amount of nitrogen assists in the liberal assimilation of phosphoric acid and potash; these elements have a close relation to each other in many of our fodder crops. A fair state of fertility of the soil is an indispensable requirement for a successful production and propagation of our most valuable grasses.

Quite frequently the entire character of the growth upon grass lands has been improved by changing from a scant to a liberal manuring, without any assistance from new seeds. Those grasses which are best adapted to the altered conditions of the soil take the lead.

The nutritive value of one and the same species or variety of grasses is liable to differ in a more serious degree, when raised under more or less advantageous circumstances, than many of our reputed meadow grasses are represented to differ among themselves, when raised under conditions which favor their successful growth.

Forage crops, above all other crops, suffer more seriously in regard to quality from a scant supply of plant food than any other class of farm crops. Large areas of grass lands are still too frequently treated with all kinds of manurial substances, without any definite idea of what they can or shall accomplish. A short discussion of some of the more prominently mentioned substances frequently used for manurial purposes upon permanent grass lands may illustrate that statement.

Common salt is known quite frequently to act beneficially on grass lands; it acts, however, more decidedly on the physical qualities of the soil than as a direct plant feeder; it assists in the absorption of moisture from the air and economizes inherent resources of moisture, and is thus apt to act better on dry lands than on moist ones; it assists in the diffusion of potash and phosphoric acid, but does not materially benefit the supply of the most essential article of plant food. The beneficial effect usually ceases after a few applications of from four hundred to five hundred pounds per acre; the lands are more exhausted after its exclusive use as a manure than before.

Gypsum, or plaster, aids in the absorption of the ammonia compounds of the air; it counteracts the tendency of a clayish soil to become hard and impervious in dry weather; it assists, like salt, in the general diffusion of potash and phosphoric acid present, by causing favorable transformations of existing compounds. A few repeated applications of from six hundred to seven hundred pounds per acre usually terminate its good services, which are frequently marked rather by a more liberal growth of clover and of leguminous plants in general than by that of grasses. Aside from lime and sulphuric acid, nothing is added to the future fitness of the soil, as far as essential articles of plant food are concerned. Gypsum, as a *sole* manurial matter used on grass lands, assists in bringing nearer the time of their failure as a remunerative fodder source.

Air-slacked lime, lime-kiln ashes and various other kinds of lime refuse are noted for their good influence on grass lands; they assist in producing a favorable decomposition of organic matter by neutralizing accumulated organic acids and securing thereby conditions favorable to the action of a beneficial microbic life in the soil. They aid in the disintegration of potash-containing silicious soil constituents, and render thereby inherent sources of

plant food more available ; they improve the general physical conditions of a compact, clayish soil by rendering it more mellow and permeable. As a direct addition of plant food they are only in exceptional cases of real importance ; they are in the majority of cases worthless upon a calcareous soil.

Marls and clayish marls, free from any perceptible amount of potash and phosphoric acid, act in the main similarly to the previously mentioned lime refuse. Earthy composts of various descriptions, if applied in large quantities, frequently act very beneficially on exposed portions of the upper part of grass roots by protecting them against an undesirable exposure to light and atmosphere, thereby favoring the formation of new and more numerous shoots. They benefit the inherent stock of plant food only as much as they contain one or more of them in an available condition, which is usually an unknown quantity.

Other substances, quite frequently of a mere local interest, might be added to the previous list, if space permitted.

Most of these previously stated manurial substances, it will be noticed, are only temporary remedies, if any. They assist more or less in economizing existing local resources of plant food. They may, however, if used intelligently, quite frequently serve as valuable helpmates in a more rational and more comprehensive economical system of manuring grass lands capable of a remunerative improvement. As an economical source of phosphoric acid, aside from ground bone, which furnishes phosphoric acid and nitrogen, in many instances finely ground mineral phosphate from Florida, South Carolina, West Indies and other localities deserve recommendation for grass lands as a top-dressing, on account of low cost. Kainite and muriate of potash are to-day our most efficient and cheapest sources of potash for forage crops.

Wood ashes are a valuable fertilizer for grass lands, if applied in sufficient quantities ; our average unleached Canada wood ash contains from 5 to 6 per cent of potassium oxide, 1.5 to 2.5 per cent of phosphoric acid and 30 to 35 per cent of calcium oxide (lime), besides small quantities of every other essential mineral constituent required for a successful growth of plants. The absence of nitrogen is somewhat compensated for by the presence of a liberal amount of lime, which favors a rapid decomposition of the vegetable matter contained in the soil. The nitrogen of the vegetable refuse matter becomes thereby in a high degree available. The good effect of wood ashes is for this reason more striking upon grass lands, rich in vegetable refuse matter, than upon dry lands, which as a rule contain less of the latter.

The good services of barn-yard manure for the production of

grasses are generally recognized, yet its efficiency may be greatly increased in this connection by the addition of some suitable potash compound, to turn its excess of nitrogen to better account. Two thousand pounds of barn-yard manure contain on an average eight to ten pounds of nitrogen, four to five pounds of phosphoric acid and nine to twelve pounds of potassium oxide. One hundred pounds of muriate of potash to every ton of barn-yard manure needed will serve a good purpose, and in many cases allow a reduction in the amount of barn-yard manure otherwise considered necessary. A top-dressing of grass land with two hundred pounds of muriate of potash and five hundred pounds of fine-ground bone has given much satisfaction in our field experiments. Our grass lands are as a rule deficient in available potash compounds.

ON SELECTION OF SEED.

The family of grasses is very numerous, — it includes all our cereals; the number of those cultivated by human effort is, however, comparatively small for limited districts. The majority of grasses are of a spontaneous growth, and in their general character, in a controlling degree, depend on the condition of the soil and climate. In regard to their duration of life they may be classified into annual, biennial and perennial grasses. The annual and biennial grasses are propagated by seeds and the perennials usually by both seeds and sprouts starting from the roots.

In examining the different grasses with reference to their mode of growth we notice a more or less marked difference among different species and varieties. Some show a decided tendency to soon send out numerous upright shoots, bearing liberally flowers; while others show this tendency more sparingly, and spend their vital energy in the production of numerous low, knotty shoots, clinging more or less closely to the ground, thereby forming a close sod. This class of grasses requires frequently from two to three years after seeding before it contributes liberally to the hay crop; it furnishes meanwhile valuable pastures.

To secure upon temporary grass lands a good and early annual yield of hay, it is necessary to select largely the seeds of those grasses which send out at once many tall, blooming shoots. The shorter the period designed for keeping the lands covered with grasses, the more ought low-growing perennial grasses to be excluded.

The degree of success upon permanent meadows, as far as the quality and quantity of the annual yield of hay is concerned, depends largely upon the care taken to ascertain the most advantageous relative proportion of both mentioned classes of grasses

under existing local circumstances. To secure the highest attainable yield requires careful local observations.

Grasses raised upon one and the same land should also be selected as far as practicable with reference to a *corresponding period of blooming*; they should be cut for hay when the majority of them are fairly advanced in blooming. The adoption of this course imparts to the crop the highest attainable nutritive value. The following statement contains the names of some of the prominent grasses, classified with reference to their tendency of growth and their adaptation to dry and moist soils:—

LIST OF REPUTED GRASSES (PERENNIALS).

I. For Dry or Moderately Moist Soils.

(a) First class (tall-growing grasses):—

Meadow fox-tail (<i>Alopecurus pratensis</i>),	. . .	May to June.
Meadow fescue (<i>Festuca pratensis</i>),	. . .	June to July.
Red fescue (<i>Festuca rubra</i>),	. . .	June to July.
Timothy, herd's grass (<i>Phleum pratense</i>),	. . .	June to July.

(b) Second class (low-growing grasses):—

English bent (<i>Agrostis alba</i>),	. . .	June to July.
Sweet-scented vernal grass (<i>Anthoxanthum odoratum</i>),	. . .	May to June.
Yellow oat grass (<i>Avena flavescens</i>),	. . .	May to June.
Sheep's fescue (<i>Festuca ovina</i>),	. . .	June to July.
Downy oat grass (<i>Avena pubescens</i>),	. . .	July.
French rye grass, tall oat grass (<i>Arrhenatherum avenaceum</i>),	. . .	May to July.
English rye grass (<i>Lolium perenne</i>),	. . .	June.
Italian rye grass (<i>Lolium italicum</i>),	. . .	June.
Kentucky blue-grass (<i>Poa pratensis</i>),	. . .	May to June.

II. For Moist and Wet Soils.

(a) First class (tall-growing grasses):—

Timothy, herd's grass (<i>Phleum pratense</i>),	. . .	June to July.
Fowl meadow (<i>Poa serotina</i>),	. . .	July to August.
Rough-stalked meadow grass (<i>Poa trivialis</i>),	. . .	June.
Meadow soft grass (<i>Holcus lanatus</i>),	. . .	June to August.
Orchard grass (<i>Dactylis glomerata</i>),	. . .	May to June.
Soft brome grass (<i>Bromus mollis</i>),	. . .	June.
Italian rye grass (<i>Lolium italicum</i>),	. . .	June.

(b) Second class (low-growing grasses):—

Red top, Rhode Island bent (<i>Agrostis vulgaris</i>),	. . .	July.
English rye grass (<i>Lolium perenne</i>),	. . .	June.
Crested dog-tail (<i>Cynosurus cristatus</i>),	. . .	June to July.
Common manna grass (<i>Glyceria fluitans</i>),	. . .	June to July.

The degree of success upon permanent meadows, as far as the quality and the quantity of the annual yield are concerned, depends

largely on the care taken to ascertain the most advantageous relative proportion of both mentioned classes of grasses under existing local circumstances. To secure the highest attainable yield requires careful local observations. Receipts for mixtures of grass seeds which have proved advantageous in one locality cannot always be relied on as best in any other place. For this reason, instead of discussing the merits of any of the many mixtures recommended by seed dealers and others, I refer to the mixture used in my own case at Amherst, which is stated on a subsequent page.

COURSE ADOPTED IN RECLAIMING AN OLD MEADOW.

The area engaged in the experiment amounted to from nine to ten acres, running from south to north along the western slope of a natural grove. The main part of the land is fairly on a level, slanting slightly towards the north and rising somewhat from the centre of the field towards the grove; this part is somewhat springy. The southern end of the land is exposed to an occasional overflow of water from adjoining hillsides. The outlet for the water, coming from both sources, had evidently been gradually obstructed by soil washed down from elevations along the north end of the field. As a natural consequence, a large part of the ground had been changed into an unsightly swamp. The entire area was covered with a worthless growth peculiar to exhausted dry lands and wet meadows, the latter in particular. The surface soil consisted of a sandy loam, from two to three feet in thickness, which was here and there underlaid by either a thin layer of hardened clay or a coarse, gravelly material. The general character of the surface soil, as well as the apparent chances of regulating its state of moisture, promised to make the field, under proper management, in an exceptional degree fit for a permanent meadow.

After lowering the outlet for the water through the adjoining lands at the northern termination of the field, it was decided to run, from ten to twelve feet apart, two parallel ditches from north to south, through the lowest part of the land. The ditching began in the month of August. One ditch from three and one-half to four feet below the surface of the ground was to serve as a main ditch for drain tiles six inches in diameter, to prevent an accumulation and subsequent stagnation of water in the upper soil. The other was an open ditch, on an average from one foot to eighteen inches deep, to assist in a speedy discharge of surface water, due to heavy rains or the melting of the snow and ice on adjoining hillsides in the spring. In both instances the necessary fall was secured to dispose of the surplus water. One surface ditch sufficed for the whole area, while branch tile drains were built to all places

where local conditions indicated an exceptional state of moisture. The tiles in the branch ditches varied from two to four inches in diameter. A stone drain ten by twenty feet wide and four feet deep served as a filter for the turbid water coming from the adjoining hillsides in case of heavy rains, before entering the tile drains. The surface ditch ran up to the stone drain, to prevent a general overflow of the meadow in case of exceptional rainfalls, etc. The deep, swampy places were filled up in part with stones and earth, or earth, as circumstances advised. The entire area was subsequently ploughed deep and left in that state over winter. The succeeding spring a wheel harrow was used to break up the rotten sod. The soil was subsequently ploughed and harrowed repeatedly, until it showed the desirable mechanical condition required for a successful cultivation of summer grain crops.

Barley and oats were chosen as the first crops. Both were seeded in drills, with rows two feet apart, to permit a thorough destruction of an objectionable foul growth by frequent use of the cultivator and hoe.

As soon as these crops were harvested, one ton of wood ashes per acre was ploughed in, to assist in the disintegration of the excess of organic peaty matter, and to serve as a general fertilizer. After ploughing and smoothing the surface by means of a brush harrow, the entire area was seeded down, in September, into grass, to serve as a permanent meadow. The more elevated portions of the field were seeded down with the following mixture of grass seeds, at the rate of from two to two and one-half bushels per acre : —

- Two bushels herd's grass (*Phleum pratense*).
- Two bushels red top (*Agrostis vulgaris*).
- Two bushels Kentucky blue-grass (*Poa pratensis*).
- Two bushels meadow fescue (*Festuca pratensis*).
- Five pounds sweet-scented vernal grass (*Anthoxanthum odoratum*).

The lower and still more wet portion of the meadow was seeded down with the following mixture of grass seeds : —

- Twenty pounds soft brome grass (*Bromus mollis*).
- Twelve pounds herd's grass (*Phleum pratense*).
- Nine pounds red fescue (*Festuca rubra*).
- Eight pounds fowl meadow grass (*Poa serotina*).
- Seven pounds Rhode Island bent (*Agrostis vulgaris*).
- Six pounds orchard grass (*Dactylis glomerata*).
- Five pounds crested dog-tail (*Cynosurus cristatus*).
- Four pounds meadow soft grass (*Holcus lanatus*).
- Two pounds sweet-scented vernal grass (*Anthoxanthum odoratum*).

From four to five pounds of alsike clover per acre were added by broadcast seeding early in the succeeding spring (1889). The seed came up well, and suffered but here and there in wet spots during the first winter. Barren spots were reseeded. The entire meadow was cut but once during the first summer season, somewhat later than usual; the majority of grasses did not, as might be expected, head out.

As soon as the first crop of hay was secured, a system of manuring was planned, to show the comparative manurial effect of top-dressing, as follows: by barn-yard manure; by ground bone and muriate of potash; by unleached wood ashes. From 1889 to 1893 the quantity of barn-yard manure was gradually reduced, to ascertain how far different quantities used per acre would affect the final results. Since 1893 each plat has received in succession annually the same quantity of one of the different kinds of manure, *to try a rotation of manures upon permanent grass lands*. The annual yield of hay on the different plats is stated below:—

Summary of Yield of Hay (Tons).

	RATE PER ACRE (TONS).		
	First Cut.	Second Cut.	Total.
1889.			
Plat 1, barn-yard manure, eighteen tons to acre,	2.73	1.14	3.87
Plat 2, barn-yard manure, eight tons to acre,	2.38	1.21	3.59
Plat 3, six hundred pounds steamed bone and two hundred pounds muriate of potash to acre,	2.50	1.03	3.53
1890.			
Plat 1, barn-yard manure, fourteen tons to acre,	3.80	1.00	4.80
Plat 2, barn-yard manure, eleven tons to acre,	3.25	1.34	4.59
Plat 3, as in 1889 (six hundred pounds steamed bone and two hundred pounds muriate of potash to acre),	3.00	.73	3.73
Plat 4, wood ashes, one ton to acre,	2.23	.68	2.91
1891.			
Plat 1, barn-yard manure, eight tons to acre,	3.26	.72	3.98
Plat 2, barn-yard manure, six tons to acre,	2.99	.72	3.71
Plat 3, as in 1890 (six hundred pounds steamed bone and two hundred pounds muriate of potash to acre),	2.32	.51	2.83
Plat 4, as in 1890 (wood ashes, one ton to acre),	2.32	.51	2.83
1892.			
Plat 1, fertilized the same as in 1891,	2.77	1.04	3.81
Plat 2, fertilized the same as in 1891,	2.70	.98	3.68
Plat 3, fertilized the same as in 1891,	2.33	.64	2.97
Plat 4, fertilized the same as in 1891,	2.18	1.02	3.20

Summary of Yield of Hay (Tons) — Concluded.

	RATE PER ACRE (TONS).		
	First Cut.	Second Cut.	Total.
1893.			
Plat 1, wood ashes, one ton to acre,	2.28	.77	3.05
Plat 2, barn-yard manure, eight tons to acre,	2.62	.86	3.48
Plat 3, six hundred pounds ground bone and two hundred pounds muriate of potash to acre,	1.94	.64	2.58
1894.			
Plat 1, wood ashes, one ton to acre,	2.50	.37	2.87
Plat 2, barn-yard manure, eight tons to acre,	2.86	.51	3.37
Plat 3, six hundred pounds ground bone and two hundred pounds muriate of potash to acre,	2.54	.18	2.72
1895.			
Plat 1, six hundred pounds ground bone and two hundred pounds muriate of potash to acre,	2.18	1.60	3.14
Plat 2, wood ashes, one ton to acre,	2.17	1.44	3.12
Plat 3, barn-yard manure, eight tons to acre,	3.02	1.04	3.13

The season of 1894 was marked by a severe drought, beginning with the month of July and extending into the fall, which affected the yield of the crop (second cut) to a serious extent. The season of 1895 was a fair one for farm work in our section of the country.

The rotation of manures upon permanent grass lands deserves a recommendation.

SERIES OF 1896.

BULLETIN No. 3.

MASSACHUSETTS CROP REPORT

FOR THE

MONTH OF JULY, 1896.

ISSUED BY

WM. R. SESSIONS,
SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF JULY, 1896.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Aug. 1, 1896.

Bulletin No. 3, Crop Report for the month of July, is herewith presented. Attention is called to the article on "The Army Worm," by the assistant entomologist of the gypsy moth committee, which is printed at the close of this bulletin. The information comes too late to be of service this year, but it is thought that a careful perusal of this article will do much toward giving information which may be of value in repelling the outbreaks of this pest which are likely to occur another year.

PROGRESS OF THE SEASON.

Report No. 139, New Series (July, 1896), of the Statistician of the United States Department of Agriculture shows that the condition of winter wheat is 75.6, against 77.9 in June and 65.8 last July. The condition of spring wheat is 93.3, against 99.9 in June and 102.2 in July, 1895. If spring is combined with winter wheat, the average condition of the whole crop is 83.4 per cent.

The preliminary report on the acreage of corn shows 98.7, as compared with that of 1895, a decrease of 1.3 points. This makes in round figures 81,000,000 acres, against 82,000,000 acres last year. The average condition of corn is 92.4, against 99.3 in July last year.

Winter rye has the average condition of 83.8 per cent, the average for last year at this time being 82.2 and for June of this year 85.2. The average for spring rye is 98.6, against 77 last year. Some damage to this grain by rust, insects and worms is reported from many States.

The average condition of barley is 88.1, as against 91.9 last year and 98 in June.

The acreage of Irish potatoes is 93.7 of that of last year, the acreage last year being 107.9 per cent of that of the preceding year. The condition is reported as 99, as against 91.5 last year. The crop is poor in most of the southern States, owing to drought, and on the Pacific coast.

The oat crop has a condition of 96.3, as compared with 83.2 last year, and is especially fine in the chief oat-producing States. The poorer conditions are in the southern States.

The returns relative to the fleeces sheared in the fall of 1895 and the spring of 1896 make the average weight for the country 5.7 pounds. In 1893 and 1894 the average stood at 5.3 pounds, and in 1895 at 5.6 pounds. Present reports sustain the conclusion made in previous years that sheep are undergoing improvement, due to better selection and breeding.

The average condition of clover July 1 was 83.7, against 88.4 on June 1 and 73.9 a year ago. In general, newly sown clover has fared best, but in some cases it has suffered considerably from grasshoppers. Drought is the most common ground of complaint and next in order the effect of a hard winter.

The average condition of timothy is 84.5, against 70.8 one year and 77.3 two years ago. There are complaints of drought from a considerable number of localities, though often in the case of old meadows it is the effects of drought last year. Winter-killing, late frosts, hail and grasshoppers are other causes of injury.

The general average for the condition of pastures fell during June from 94.5 to 91, but it is still 12.3 points higher than last year. Where the condition is low drought is the usual cause. There are a few complaints of the army worm.

The condition of apples declined from 71 to 64.6 during June. Prospects for excellent crops still continue in New England, New York, Pennsylvania, Michigan and Iowa. In other parts of the country the condition is far below the average.

Taking the country at large the peach crop promises to be one of medium proportions. During the past month a fall of 12.9 points has taken place, leaving the general average at 51.8.

The average condition of rice is 82.9, against 84.4 last

year. Prospects are poorest in Louisiana, the leading rice State, being 25 per cent below the standard.

According to preliminary returns, a less area has been planted to tobacco this year than last in Kentucky, Ohio, Indiana, Pennsylvania, Illinois and New York, the decrease running from 11 to 15 per cent. Little change in area has taken place elsewhere. The average percentage makes the total breadth 6.2 per cent short of 1895. The average condition of the crop is 91.5, against 85.9 last year. By States the percentages range from 82 in Tennessee to 104 in Massachusetts.

The July returns for cotton make the average condition 92.5, against 97.2 in June and against 82.3 last year. Lice and drought are the principal causes of injury.

In Massachusetts the acreage of corn compared with last year is 102 and the average condition July 1 is 94; the average condition of spring rye 99; the average condition of oats 100; the average condition of barley 100; the acreage of potatoes 83 and the average condition 101; the average condition of beans 99; the acreage of tobacco 100 and the average condition 104; the average weight of wool per fleece 5.1 pounds; the average condition of clover 89; the average condition of timothy 88; the average condition of pasturage 95; the average condition of apples 93; the average condition of peaches 34; and the average condition of grapes 85.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES WEATHER-CROP BULLETINS.]

Week ending July 6. — Week cooler than usual along the immediate California coast, over extreme western Texas and southern New Mexico, and on the south Atlantic and New England coasts. Week warmer than usual over the northern portion of the Lake region, on the north Pacific coast and throughout the central and northern Rocky Mountain regions. Elsewhere the temperature did not vary much from the normal. The rainfall was generally ample east of the Rocky Mountains, except over the western portion of the Gulf States. More than the usual amount fell over portions of the central valleys and east Gulf States. The week was, upon the whole, exceptionally favorable and crops generally made

excellent progress. Winter-wheat harvest is about completed, except in the more northerly States. Corn has made fine progress during the week and an exceptionally fine crop is promised in the principal corn States. The condition of cotton has improved. The outlook for tobacco continues flattering.

Week ending July 13. — The week averaged cooler than usual in the lower Lake region, the Ohio, central Mississippi and lower Missouri valleys, and throughout the southern States. In New England, the upper Lake region, upper Missouri valley, throughout the central and northern Rocky Mountain districts and on the Pacific coast the week averaged warmer than usual. The week was practically without rain over the greater part of the Mississippi and lower Ohio and lower Missouri valleys, and only very light showers fell in the upper Lake region. Good rains fell in Texas. In the Middle and South Atlantic States the rainfall was exceptionally heavy, but no appreciable amount of rain fell on the Pacific coast. On the whole the weather conditions were not as favorable as those of the two preceding weeks. In the great corn States the crop continues in the most promising condition, but it suffered some injury from rain in the South Atlantic and east Gulf States. Cotton has been injured by rain in some sections and improved in others. Some spring wheat has been cut in Iowa. The general condition of this crop is not satisfactory. Tobacco continues in promising condition.

Week ending July 20. — Week warmer than usual over the northern portion of the west Gulf States and in eastern Maine, but in all other districts east of the Rocky Mountains cooler than usual. Over the northern plateau region and on the Pacific coast week generally warmer than the average. From the lower Missouri and central Mississippi valleys eastward over the lower lake region and Ohio valley, and over portions of the east Gulf States and the Atlantic coast the rainfall exceeded the average. From the Dakotas eastward over Minnesota, Wisconsin and the greater part of Michigan, in the west Gulf States, and over the greater part of the Atlantic coast the rainfall was below the average. No rain fell on the Pacific coast. The week was generally favorable for growing crops in the principal agricultural States. Corn

has made excellent progress and the outlook continues most promising. There has been too much rain for cotton in some sections but in others it has materially improved. The general outlook for tobacco continues promising. Some ploughing for fall seeding has been done in Michigan.

Week ending July 27. — Week generally warmer than usual over the southern districts east of the Rocky mountains. Along the immediate Pacific coast, in northern New England and over portions of the Lake region and Middle Atlantic States, the temperature was nearly normal. Elsewhere the week was decidedly cooler than usual. From the central Mississippi valley eastward over the Ohio valley and southern portion of the Lake region to the Middle Atlantic and New England coasts the rainfall exceeded the average. The rainfall was also very heavy in Iowa, Nebraska and north-eastern Colorado. Elsewhere the rainfall was generally decidedly below the average. In the States of the central valleys and on the Atlantic and east Gulf coasts the week has been very favorable for all growing crops. Although corn has suffered to some extent from heavy rains the general outlook for an exceptionally fine crop continues promising. Over the eastern portion of the cotton region and in Texas cotton has made good growth, but elsewhere it is not so favorable. Late sown spring wheat did not head in North Dakota and is being ploughed up. The general condition of tobacco continues good.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending July 6. — New England. Boston: First of week dry, with much sunshine, latter part cloudy and wet; crops were suffering, but rain fills present needs and all crops doing well; cranberries in blossom, with favorable outlook.

Week ending July 13. — New England. Boston: Rainy first of week, clear and hot most part; most crops growing well; pastures very good; hay crop of good quality, but below average; turnip seed about harvested in southern Connecticut, fair crop; onion seed is very promising; other seed looking well.

Week ending July 20. — New England. Boston: Light showers first part of week beneficial to grain; dry, with average sunshine, during rest of week; rain needed; some barley has matured, a week early; pastures drying.

Week ending July 27. — New England. Boston: The high temperature and abundant rains have advanced crops very fast; some damage to fruit trees and standing crops by high wind on the 16th; pastures excellent in south portion and improving in north; cloudy weather has delayed hay and grain harvest in south portion.

MASSACHUSETTS WEATHER FOR JULY, 1896.

Along the coast the mean temperature for the month was at or slightly below the normal, and the temperature range was small. At Woods Holl, Mass., the highest temperature was 80° and the lowest 58°, making a monthly range of only 22°, which is very small for even that place of slight changes. In the interior and western sections the thermometers reached several degrees above 90 on the 12th to 14th. At Fitchburg and Springfield the mean temperature was 0.6° warmer than is usual for the month.

The rainfall was slightly below the normal along the coast, but was in excess in the interior. At Springfield one and one-fourth inches came in excess of the usual July fall. At Fitchburg the excess amounted to but three-fourths inch, while at Boston and along the southern coast the deficiency was about one-half inch. There was a good deal of cloudy and foggy weather and the number of rainy days was more than usual. The consequence has been a poor month to harvest hay and grain, but splendid for the growth of corn, tobacco, and in fact all field crops. Grass grew very fast on low lands during all the first part of the month; the amount on some fields being doubled during that time.

During the passage of a severe thunder-storm on the 5th, 1.30 inches of rain fell in 17 minutes, and 1.69 inches in 60 minutes, at Fall River, Mass. The high wind on the 16th did some damage to corn, grain and fruit in western counties. The weather has been favorable for fruit generally, and the outlook for most varieties is very flattering.

In the circular to correspondents returnable July 25 the following questions were asked : —

1. What insects are proving most troublesome in your locality?

2. What is the condition of Indian corn, and what proportion of the crop will be put into the silo?

3. What is the quantity and quality of the hay crop as compared with former years?

4. What forage crops are raised to supplement the hay crop and eke out the pastures, and what is their condition?

5. What is the condition of market-garden crops, including potatoes, and how have those already harvested compared in yield and price with former years?

6. What is the prospect for apples, pears, peaches, quinces, grapes and cranberries?

7. What is the condition of pasturage in your locality?

8. How have rye, oats and barley compared with former years?

Returns were received from one hundred and forty-eight correspondents, from which the following summary has been made : —

INSECTS.

The potato beetle is the insect most generally reported as doing damage, but it is not unusually prevalent. Next comes the army worm, forty-six correspondents mentioning its presence. No section of the State seems exempt from it. In many localities it is reported as present, but not doing serious damage. In these places it should be carefully watched next year, as it is most likely to appear in destructive numbers where it gained a foothold this year and did not appear in force. All meadows where the worms appeared this year, even in small numbers, should be burned over early next spring. Attention is again called to the article on this pest at the end of this bulletin. Grasshoppers are reported as doing some damage to pastures and mowings in the western counties. Other insects mentioned are the horn fly, currant worms, squash bugs, cabbage worms, white grubs, the elm tree leaf beetle, cut worms, tobacco worms, maggots, wire worms, green lice, the curculio, corn worms and fire worms.

INDIAN CORN.

Indian corn, as a whole, has been rather backward, but is now growing fast and a good crop is promised. Stand and color are generally spoken of as good. Very few speak of the crop as poor or below the average, complaint being principally confined to lateness. Probably rather more will be put into the silo than ever before. The poor hay crops of the last few years have led farmers to pay more attention to the silo than was formerly the case. The wide variation in the reports makes it impossible to estimate the proportion of the crop used for ensilage with any degree of accuracy.

THE HAY CROP.

The frequent rains of the month delayed haying and in many sections it was not completed at the time of making returns. The crop necessarily falls below the average and probably three-fourths of a full crop is as safe an estimate as could be made. The quality is generally spoken of as good, though much was damaged by rain.

FORAGE CROPS.

The drought of the early part of the season, forecasting a small hay crop, doubtless led many farmers to give unusual attention to forage crops. The rains during July were very timely for these crops and they are all reported as in excellent condition. Fodder corn is the crop most extensively grown and easily leads the rest in point of production. Oats, Hungarian grass, barley and millet, in the order named, are also much grown. Other crops grown to a less extent are rye, oats and peas, oats and vetch, barley and peas, soja beans, wheat and vetch. Cabbage and turnips, while not strictly speaking forage crops, are also raised for stock feeding.

MARKET-GARDEN CROPS.

Market-garden crops are generally in good condition and the prospect is for a good yield of those not yet harvested. Prices have held about as usual, certainly not falling off from last year. So much attention is now paid to this branch of

farming that growers must depend on exceptional earliness or excellence if they hope to secure high prices.

EARLY POTATOES.

Contrary to the expectation last month early potatoes do not now promise to be a full crop. Very few have been dug as yet. The shortness in yield is probably due to the drought of the early part of the season. There is some complaint of blight and rot, and in the south-eastern counties white grubs are reported as attacking the tubers. Prices are generally spoken of as low and often as lower than ever before.

FRUITS.

Apples generally promise a good crop of good fruit. As heretofore indicated there will be very few pears and practically no peaches. Quinces will also generally be a light crop and there is some complaint of blight. Grapes promise a full crop, many speaking of them as unusually good. The cranberry crop will be good, the reports from the region of commercial production being favorable. There is some complaint of injury to bogs from the army worm.

PASTURAGE.

The frequent rains during July have kept pastures in good condition in most sections. In the western counties, where last month the condition was most precarious, correspondents now almost unanimously report the condition as good. Most reports of poor condition come from eastern and south-eastern sections.

GRAIN CROPS.

Rye, oats and barley are all good average crops, many speaking of them as excellent. Barley is but little grown except for fodder, and probably more oats are cut for fodder than are allowed to mature the grain.

NOTES OF CORRESPONDENTS.

(Returned to us July 25.)

BERKSHIRE COUNTY.

Mount Washington (H. M. WEAVER). — Potato bugs are doing some damage. Corn looks well; no silos in town. Hay is of good quality but the crop was light on old meadows. Fodder corn is being raised to supplement the hay crop. There will be plenty of apples, pears and cranberries. Pasturage is in good condition. Rye is a short crop but oats are good.

Monterey (W. S. BIDWELL). — The army worm and the potato bug are doing some damage. Indian corn is in fair condition and one-half the crop will be put into the silo. The hay crop was lighter than usual but as large as that of last year. Millet and fodder corn are being planted to help out the hay crop. Potatoes promise a good crop but prices are low. Apples will be plenty but there will be no other fruit. Pasturage is in good condition. Oats were a superior crop except where injured by the army worm and rye was an average crop.

Tyringham (GEO. F. KOPP). — The army worm has appeared somewhat but has done no special damage. Corn is in good condition; no silos. We are cutting a good crop of hay of good quality. Hungarian grass is being raised as a fodder crop. Apples will be a fair crop. Pasturage was never in better condition. Rye, oats and barley were all good crops. Tobacco is doing well, with the prospect of a good crop.

Lee (A. BRADLEY). — The potato bug and the army worm are doing some damage. Corn is 5 per cent above the normal in condition; about 10 per cent will be put into the silo. The hay crop is 10 per cent above other years in quantity and quality. Fodder corn is mostly relied on to supplement the hay crop. Apples will be about three-fourths of an average crop. Pasturage is above the average in condition. Rye, oats and barley are all full crops. Probably fifty acres of grain in the southern half of Berkshire

County have been destroyed by the army worm, and much grain was cut unnecessarily in anticipation of the appearance of the worm.

Windsor (H. A. FORD). — Grasshoppers are doing some damage. Indian corn is not as early as common; perhaps 10 per cent of the crop will go into the silo. The hay crop is a little larger than for the past two years; quality good but weather very poor for gathering. Oats, corn and millet are the principal forage crops. Market-garden crops are in fair condition. Not many potatoes dug as yet but the crop is below last year's. No fruit for market but enough for home use. Pasturage is in quite good condition. Rye, oats and barley are average crops.

New Ashford (ELIHU INGRAHAM). — Corn is in fair condition; no silos in town. The hay crop has been average with the past two years and of good quality. Sowed corn is the principal dependence as a fodder crop. Potatoes are looking well but none have been harvested. There will be a light crop of apples and few pears. Pasturage is in fair condition. Rye, oats and barley are good crops. The frequent rains are causing meadows to look finely where the grass is cut.

Williamstown (S. A. HICKOX). — Army worms are doing some degree of damage. Corn is a small stand but of good color and growing fast; about 5 per cent will go into the silo. Hay is a three-fourths crop of good quality. Sweet corn, Hungarian grass, oats, barley and millet are raised to supplement the hay crop. Potatoes are a good crop but a few are harvested as yet. Apples will be a good crop, pears 10 per cent of a crop and grapes 60 per cent. Pastures are in fairly good condition. Rye, oats and barley are about average crops.

FRANKLIN COUNTY.

Heath (O. D. CANEDY). — Grasshoppers are doing much damage. Corn is looking well and one-half of the crop will be put into the silo. Hay is a light crop of good quality. A good many acres of oats and Hungarian grass are raised for fodder. Potatoes look rather slim. Apples will be a fair crop, pears poor, quinces poor and grapes good. Pasturage is in poor condition. Help is scarce and wages high, and most of our farms are large enough for two.

Bernardston (R. H. CUSHMAN). — Army worms, white grubs, cabbage worms and grasshoppers are all doing some damage. Corn is in first-class condition and 60 per cent will go into the silo. The hay crop is not up to last year in quantity but the quality is good. Oats are being hayed in large quantities. Early

potatoes will be a light crop. Pastures are short but improving from recent rains.

Shelburne (GEO. E. TAYLOR). — Grasshoppers and army worms are doing some damage. Condition of corn fair and perhaps 5 per cent will be put into the silo. Hay is less than an average crop in quantity but the quality is very fine. Corn and oats are raised to supplement the hay crop and are in good condition. Apples will be an average crop but all other fruits will be light. Pasturage is very short but is still green. Oats are very fine and heavy. The army worm appeared in several places in this vicinity and destroyed about three acres of grass and millet for me. It has now disappeared.

Whately (FRANK DICKINSON). — The army worm has done damage in some localities. Corn is growing very fast; only one silo in this neighborhood. The hay crop was of extra quality but below the average in quantity. Corn is the crop mostly raised for fodder and the condition is good. Potatoes are about an average crop, with prices hardly up. Apples are a full crop, few pears, no peaches, plenty of grapes. Pastures are improving. Rye and oats are full crops.

Leverett (W. L. BOUTWELL). — The army worm is doing some damage. Indian corn is in average condition and about half the crop will go into the silo. Hay was about a three-fourths crop of extra quality. Sweet corn, oats and barley are raised to supplement the hay crop and all are doing well. Market-garden crops are all average except potatoes, which are suffering from blight and show a very light yield. The prospect for fruit is better than usual. Pastures are getting rather dry. Rye, oats and barley are not more than average crops.

Northfield (T. R. CALLENDAR). — The potato bug is numerous and the army worm has done some damage. Corn is a little late but is looking finely; not more than one-tenth of the crop is grown for the silo. The hay crop has been rather better than last year on the whole. Barley and oats are much grown for forage and are in fine condition. The season has been favorable for all market-garden crops; yield abundant, prices low. Apples are well fruited, pears light, no peaches, grapevines loaded with fruit. Pasturage is in fairly good condition. All small grains are remarkably good crops. Tobacco is looking well though somewhat uneven.

New Salem (DANIEL BALLARD). — Potato bugs and grasshoppers are very plenty. Indian corn is a little backward but growing finely; very little put in the silo. The hay crop is nearly average in quantity and of good quality. Oats, peas and oats, fodder corn and Hungarian grass are raised to supplement the hay crop and are

in good condition. There will be a good crop of apples and some grapes and cranberries. Pasturage is in good average condition. Rye and oats have yielded well.

HAMPSHIRE COUNTY.

Enfield (D. O. CHICKERING). — Potato bugs are quite plenty. Corn is looking very well. The hay crop is above the average in quantity and fully up in quality. Rye, oats and corn are raised for forage and all are in fine condition. Potatoes look well. The prospect is good for apples, grapes and cranberries. Pastures are holding out well, much better than usual. Rye and oats are better crops than for several years. Haying is progressing slowly and but little is secured without getting wet.

Pelham (J. L. BREWER). — Cabbage worms and potato beetles are doing some damage. Corn looks very well; none will be put in the silo. The hay crop will be about a two-thirds crop, as in the past two years. Sweet corn and oats and peas are the principal fodder crops raised to supplement the hay crop. Market-garden crops all look well. Apples will be half a crop, pears one-fourth a crop, quinces good, grapes good and cranberries good. Pastures are looking well for this time of year. Rye and oats compare favorably with former crops. Blueberries are abundant; huckleberries are just coming on and promise well.

Amherst (Wm. P. BROOKS). — The army worm, elm tree leaf beetle and potato beetle are doing damage. Corn rather backward and stand uneven but color good; perhaps one-fifth will go into the silo. Hay is about three-fourths of an average crop with quality good. Corn, millet and Hungarian grass, oats, oats and peas and vetch are raised as fodder crops and are in good condition. Potatoes look well but prices are very low. Apples generally promise well, pears poor, quinces good, no peaches and grapes good. Pastures are in excellent condition. Rye is a good crop and oats look well. The army worms have done much damage in some late fields of timothy and grain and have injured some fields of corn. The most serious damage, however, will be in reducing the yield of rowen in many fields. In a great many places they have eaten all the new growth and the meadows are browner than when first cut. All mowings where they have been found should be burned over early next spring.

Hatfield (THADDEUS GRAVES). — The army worm is doing some damage. Corn is in fine condition but none will be put into the silo. The hay crop is good both in quantity and quality. No forage crops are raised to supplement the hay crop. Potatoes

have been stricken with blight; yield small and prices low. The prospect is good for all kinds of fruit. Pasturage is in good condition. Rye, oats and barley are about the usual crops.

Westhampton (F. A. BRIDGMAN).—Potato bugs, grasshoppers and army worms are doing some damage. Indian corn looks fairly well. The hay crop was about half an average crop owing to dry weather. Fodder corn is the principal forage crop raised. Apples are abundant; scarcely any pears or peaches. Pastures are growing up to brush. Rye, oats and barley are about the same as in former years.

Chesterfield (HORATIO BISBEE).—Potato bugs are doing some damage. Corn is in good condition; not more than one-fifth of the crop will go into the silo. The hay crop is rather larger than last year and of average quality. Corn, oats, Hungarian grass and barley are raised to supplement the hay crop and all are looking well. Early potatoes are a light crop. Apples are looking well, other fruit a failure. Pasturage is in fine condition. Rye, oats and barley are all cut for fodder. The past month has been cloudy, with frequent showers, and all crops are now looking well.

HAMPDEN COUNTY.

Chester (P. M. ADZIMA).—Potato bugs are doing some damage. Corn never looked better and two-thirds of the crop will be put into the silo. The hay crop was of good quality but was not average in quantity. Corn is about the only forage crop raised. Potatoes are looking well but very few have been harvested. The prospect is good for all kinds of fruit. Pasturage was never in better condition. Very little grain is raised in this vicinity.

Blandford (E. W. BOISE).—The potato beetle is the only insect troubling our farmers. Corn is above the average in condition; three-fourths of the crop will be put in the silo or cured as fodder. The hay crop is about three-fourths of an average in quantity and the quality is good though much has been caught in the rains. Corn, oats and peas, barley and Hungarian grass are the principal forage crops raised. More attention is paid to forage crops than ever before. Potatoes show heavy tops and there is little complaint of blight. Apple trees are heavily loaded with extra fruit. All other fruits and berries are very plenty. Pastures are in only fair condition. Rye oats and barley are more than average crops.

West Springfield (N. T. SMITH).—The black squash bug is doing some damage at present. Corn is in fine condition but a little backward; perhaps 5 per cent will be put into the silo. The

hay crop is about 80 per cent of an average in quantity and the quality is first-class. Oats, corn, millet and barley are the principal fodder crops raised and all have made a good growth. Market-garden crops are fully up to the average in condition and yield but prices are very low. Apples promise a large yield, grapes good, all other fruits very light. Pasturage has improved from the recent rains and is as good as usual at this season. Rye, oats and barley are fully up to average crops.

Agawam (REUBEN DEWITT). — Corn is looking very well now. The silo is gaining in popularity every year. The hay crop is a little later than last year. Corn, oats and barley are the principal forage crops and all are looking well. Potatoes are hardly as good a crop as last year. Apples are a fair crop; all other fruits, except perhaps grapes, are very poor. Rye is hardly as good a crop as usual. Oats are raised mostly for green feed or for hay. Pasturing is but little practised, the cows being kept in the barn and fed with green feed.

Wilbraham (H. M. BLISS). — The potato bug is doing some damage. Indian corn is in good condition; not more than one-thirtieth of the crop will be put into the silo. Hay is three-fourths of an average crop in quantity and of good quality. Barley, fodder corn and turnips are raised to supplement the hay crop. Potatoes are not more than a three-fourths crop and prices are low thus far. Fruit will be a light crop with the exception of grapes. Pasturage is in good condition. Rye, oats and barley are about average crops. The unfavorable weather has delayed haying so that nearly one-fourth of the grass is still standing.

Monson (W. M. TUCKER). — Squash bugs and potato bugs are doing some damage. Corn is in fine condition; about a week later than last season but growing very fast; about 10 per cent will go into the silo. Hay not quite average in yield but quality good. Rye, oats and peas, corn, barley and oats are the principal forage crops raised and they never looked better. Market-garden crops are good as a whole though prices are rather low. Apples promise well, pears are very scarce, no peaches, and grapes plenty. Recent rains have helped pasturage but cows have shrunk nevertheless. Rye is not a large straw but is well filled out. Oats and barley never looked better. There is quite general complaint of sorrel in our best grass lands where it was never seen before.

WORCESTER COUNTY.

Southbridge (G. L. CLEMENCE). — Indian corn is a little later than usual but is in good condition; half the crop will be put into

the silo. The hay crop is from 25 to 33 per cent short in quantity but the quality is very good. Oats and peas, Hungarian grass and fodder corn are the principal forage crops raised. Potatoes look well but none are harvested as yet. Apples will be more than an average crop but all other fruits are short. Pasturage is in poor condition.

Spencer (H. H. KINGSBURY). — The army worm has appeared on several farms in town. Corn is very thrifty and of good color and size; half a dozen silos will be filled. Hay is an average crop of excellent quality. Fodder corn and Hungarian grass are the principal fodder crops raised and they are growing finely. Market-garden crops promise favorably; peas have been high; potatoes fair in yield with price low. Apples will be a large crop; pears, peaches and quinces a failure, grapes plenty. Pasturage is in very good condition. Oats and barley are heavy and well filled out; oats were mostly cut for fodder while in milk. Frequent showers have delayed haying so that there is still one-third of the crop to be cut.

Barre (J. L. SMITH). — The army worm has reached most of the oat fields and is eating them fast. It has eaten nothing else as yet. Indian corn is a little late but is growing fast. The hay crop was a good average as to quantity and of good quality. Corn, oats, millet and Hungarian grass are raised to supplement the hay crop and are in good condition. There will be a good crop of apples of excellent quality. Pasturage is in good condition. Oats and barley are about as usual as to yield.

Templeton (LUCIEN GOVE). — Potato bugs are doing some damage. Corn is more backward than usual but is growing rapidly now; about 20 per cent of the crop will go into the silo. The hay crop has been the lightest for some years but the quality is good. Oats, barley, Hungarian grass, millet and corn are raised as forage crops and are in good condition. Market-garden crops are not quite up to the average. Potatoes are a fair average in yield and price. Apples are a good crop, pears light, no peaches and grapes poor. Pastures are now in average condition. Winter rye was a fair crop and oats and barley are very good. In Gardner, Hubbardston and Westminster the army worm is very destructive on several farms.

Bolton (H. F. HAYNES). — Insects are not very troublesome though one farm has a small company of the army worm. Indian corn looks well; there are eight silos in town. The hay crop is about 80 per cent of an average, much better than was expected. Golden millet and corn fodder are used to supplement the hay crop. Oats are all cut for green fodder. Early potatoes are a light

crop with price at 60 cents per bushel. Apples will be a great crop, pears few, no peaches, few quinces, grapes good. Pasturage is in good condition. Rye, oats and barley were mostly cut green.

Holden (G. S. GRAHAM). — Cabbage worms, cut worms and potato bugs are doing some damage. Corn is looking finely and about 25 per cent of the crop will go into the silo. The hay crop is greater than last year and I think about an average. Corn, oats, barley and Hungarian grass are raised to supplement the hay crop and are in good condition. Apples and grapes never looked better, pears not so plenty. Pastures are in as good condition as in other years. Rye, oats and barley were about the average and all cut for feed. Considerable hay is not yet cut.

Worcester (S. A. BURGESS). — The army worm is doing some injury to oats. Other troublesome insects are cut worms, potato bugs and white grubs. Indian corn is in first-class condition. The hay crop has been a fair average in quantity and quality. Oats, wheat, corn, rye, barley and Hungarian grass are raised for forage crops and are in good condition. Market-garden crops are a fair average in yield and price. Apples will be a fair crop, pears scarce, no peaches, no quinces, grapes and cranberries fair. Rye, oats and barley are average crops. The potato blight is doing considerable damage.

Sutton (O. P. JOHNSON). — The army worm has just made its appearance. Corn is looking first-rate but is all of a week backward; not more than a quarter will go into the silo. The hay crop is greater than last year and about an average crop. Hungarian grass and fodder corn are the principal forage crops. Potatoes are about an average crop but not many have been harvested. All fruits are good except pears and peaches. Pastures are in splendid condition. Rye, oats and barley are looking fairly well.

Blackstone (L. R. DANIELS). — The potato bug is doing some damage. Corn is in very good condition and only a very small portion of the crop is put into the silo. The hay crop is about the same as last year with quality good. Golden millet, barley and oats are the principal forage crops raised and are generally in good condition. Condition of market-garden crops good, yield the same, prices low; potatoes about two-thirds the usual price. Apples are a good crop. Pasturage is in very good condition for this time.

MIDDLESEX COUNTY.

Dunstable (A. J. GILSON). — Indian corn needs more rain at the present time; Blunt's Prolific is the principal variety put into

the silo. The hay crop was low in quantity but of good quality. Fodder corn cut and fed green is the principal forage crop and this is showing the effect of want of rain. Apples promise a large crop, no pears, peaches or quinces, grapes and cranberries promise an average crop. Pastures are dry and short of feed. Rye, oats and barley are rather above average crops.

Westford (ARTHUR WRIGHT).—Potato bugs are doing some damage. Corn promises to be about half a crop. The hay crop was a little heavier than last year but hardly an average with other years. Corn and oats are the principal forage crops raised. Market-garden crops are generally in good condition. Apples are looking well, pears, peaches and quinces scarce. Pasturage is in very fair condition. Rye, oats and barley are about the same as last year. Army worms are reported in Groton but none have been seen here.

Lowell (C. L. MARSHALL).—Cut worms are doing some damage. Corn is in prime condition and a large proportion will be put into the silo, as hay is a short crop. The hay crop is rather under average in quantity but of good quality. Corn, Hungarian grass and oats are the principal forage crops raised. Market-garden crops are in good condition and the yield is fair; prices below former years. Apples are very abundant, pears and grapes good, no peaches and quinces. Pasturage is in very good condition. Early sown rye and oats did poorly, but those sown later have made fine and large crops.

Concord (WM. H. HUNT).—Indian corn is growing well. On good grass land that has been well cared for the hay crop is good, elsewhere it is light. Oats, peas and oats, millet, Hungarian grass, barley, turnips and cabbage are all used to supplement the hay crop. Potatoes are not dug yet but are looking well. Apples will be a good crop where the canker worm did not work; pears are a very light crop, no peaches, quinces blossomed and set well but have been struck by a blight, grapes a full crop and cranberries average. Pasturage is now in fair condition. Rye, oats and barley are about average crops.

Woburn (W. H. BARTLETT).—Potato bugs, squash bugs and cut worms are doing some damage. Hay has been about an average crop in quantity and quality. Hungarian grass, oats and fodder corn are grown as forage crops and are looking very well. Full crop of apples, no pears or peaches and few quinces. Pastures are short of feed at present. Rye and oats are good crops. Squashes look well but are a little late. Prices for market-garden truck have been as good as other years. Prices vary but little from year to year. Up till the last of July or the first of August

we generally have good trade ; then farmers finish haying and have time to attend to selling their produce, which keeps the market full until frost kills the vines. Pickle picking will soon begin.

Sherborn (N. B. DOUGLAS). — Potato bugs are doing some damage. Indian corn is good though rather late ; little, if any, will be put into the silo. Hay is a three-fourths crop of excellent quality. Oats, Hungarian grass and barley are the principal forage crops and all promise well. Potatoes look well but have set poorly. Apples, grapes and cranberries are full crops. Pasturage is above the average at this season.

Hopkinton (W. V. THOMPSON). — Maggots in squashes and cucumbers are doing some damage. Corn is in good condition and most of the fodder will be put into the silo. Hay is about a three-fourths crop. Corn and Hungarian grass are the principal forage crops raised and are in good condition. Potatoes are looking well. Apples are a heavy crop of very fine fruit. Oats are a good crop.

ESSEX COUNTY.

Haverhill (EBEN WEBSTER). — Corn is of good color and up to the average ; not more than one-fourth of the crop will be put into the silo. Hay crop of good quality but a little below the average in quantity. Corn, winter rye, barley and oats are the principal forage crops and are all looking well. Yield of market-garden crops good ; prices a little higher than last year ; not many potatoes harvested. Apples and grapes good, but pears and peaches scarce. Pasturage is in very fair condition. Rye, oats and barley are not much grown for grain.

Salisbury (WESLEY PETTENGILL). — Potato bugs are doing some damage. Corn is looking well but only a small part will be put into the silo. The hay crop was about the same as last year in quantity and of good quality. Corn fodder is the principal forage crop raised. Market-garden crops are looking well ; potatoes on high land will be light, on low land looking well. Apples promise a large crop, very few pears, no peaches, grapes look well, cranberries need rain. Pastures are in fair condition, having been kept up by the light rains. Rye, oats and barley compare well with other years. There is an immense crop of blueberries.

Newbury (G. W. ADAMS). — Potato bugs are doing some damage. Corn is in good condition and 10 per cent will be put into the silo. Hay is about a three-fourths crop of good quality. Fodder corn, oats and barley are raised to supplement the hay crop and are backward for want of rain. Market-garden crops are in fair condition but suffered somewhat from drought. Apples

promise a very good crop, no pears or peaches, few quinces and a good crop of grapes. Pastures are badly dried up. Rye, oats and barley are a little late.

North Andover (PETER HOLT, Jr.). — Corn is looking fairly well and nearly all the crop will be put into the silo. The hay crop is far above the average in quality and is three-fourths of a full crop. Corn, oats, barley and Hungarian grass are raised as forage crops and are all in good condition. Potatoes are a small yield and the price is so low that few have been marketed. Apples and grapes will be a full crop; no pears or peaches and few quinces. Feed in pastures is short and rain is needed. Oats and barley have been good crops. Haying is nearly done. Rain is much needed for all growing crops.

Topsfield (B. P. PIKE). — Horn flies are rather troublesome. Indian corn is in fair condition and 10 per cent of the crop will go into the silo. The hay crop was a three-fourths crop of excellent quality. Hungarian grass is about the only forage crop raised and its condition is only fair. Early potatoes now promise much less than an average crop. Apples good, no peaches, pears scarce. Pastures are very dry and have been below the average all the year. Rye, oats and barley are about average crops. Berries are very plenty and bring good prices.

Manchester (JOHN BAKER). — Corn is in good condition; no silos. Hay is about a two-thirds crop of good quality. The forage crops raised are oats, Hungarian grass, rye and corn, and they are all in good condition. Market-garden crops are in good condition but prices are very low. Apples promise a very good crop, pears few, no peaches. Pasturage is in very poor condition. Rye, oats and barley are about average crops.

NORFOLK COUNTY.

Medway (MONROE MORSE). — Army worms are doing some damage. Corn is in good condition. The hay crop was light and the weather interfered with the best results in curing. Oats and fodder corn are the forage crops raised and are in satisfactory condition. Potatoes promise a good yield; cannot say as to other market-garden crops. Apples will be a very good crop, pears small, no peaches and grapes fair. Pasturage is deficient in condition. Rye is a good crop. Oats and barley are only grown for fodder.

Medfield (GEO. R. CHASE). — Army worms are doing some damage. Corn is in good condition; proportion for the silo very small, not more than 5 per cent. The quality of the hay crop was

better than last year and the crop was heavier on good soil. Oats and peas are raised for forage and are in good condition. Market-garden crops are in poor condition; potatoes a poorer crop than usual and lower in price. Apples will be a great crop, pears fair, no peaches, quinces light, grapes a great crop and also cranberries. Pasturage is in pretty good condition. Rye and barley are not up to average crops. Oats are an average crop.

Randolph (R. A. THAYER).—Potato beetles are doing some damage. Indian corn is very promising; only a small portion of the crop is grown for the silo. Hay was a good average crop but more than usual has been injured by rain. Oats, fodder corn and millet are the principal forage crops and all are in very promising condition. Market-garden crops are in fine condition; yield very good but prices low. Apples, grapes and cranberries will be good; very few pears or peaches. Pasturage is fully up to the average in condition. Rye, oats and barley have given, or promise, full average crops.

BRISTOL COUNTY.

Easton (H. M. THOMPSON).—Corn in good condition; only a small fractional part will enter the silo. Hay is an average crop in quantity and quality. Oats and Hungarian grass are the principal forage crops and are in good condition. Market-garden crops are in good condition; yield average with prices low. The prospect is good for all kinds of fruit. Pastures are in pretty poor condition. Rye, oats and barley are average crops. Haying commenced the latter part of June and has continued to the present time, when it is practically completed.

Mansfield (WM. C. WINTER).—The curculio is doing some damage to fruit. Corn has been doing well but is suffering from drought; only one silo in this vicinity. Hay is about 70 per cent of last year's crop in quantity and of excellent quality. Oats and Indian corn are the principal forage crops and are both doing well. Vegetables poor crops and prices low; potatoes a good crop but prices very low. Apples a fair crop, pears very light, no peaches, quinces fair, potatoes good; prices very low. Pastures average very poor in condition. Rye, oats and barley are more than average crops.

Attleborough (ISAAC ALGER).—Corn is in good condition; no silos here. Potato bugs have done their usual amount of damage but other insects are very scarce. Hay was an average crop of fine quality. Corn, Hungarian grass, millet and barley are the principal forage crops raised. Potatoes are looking finely. Apples, grapes and cranberries promise good crops. Pasturage is

in average condition. Rye and barley are about average crops and oats are above the average.

Somerset (JOSEPH GIBBS). — Cut worms, white grubs and army worms are doing some damage. Indian corn is rather backward but looks very promising; no silos in this vicinity. Hay was an average crop. The principal forage crops are corn and Hungarian grass. Market-garden crops are good but prices are low. Potatoes are blasting and rotting on some fields, elsewhere the yield is good but prices are low. There will be an average crop of apples, no peaches, pears one-third of a full crop. Pastures are in good condition. Rye and oats are good crops.

Dartmouth (L. T. DAVIS). — The army worm has done considerable damage in this section; white grubs are also troublesome. Corn is looking very fine and is making rapid growth; perhaps one-half of the crop will go into the silo. Quantity of hay crop rather below average but quality very fine. Oats, barley and fodder corn are the forage crops grown and are looking finely. Potatoes are being badly eaten by grubs; prices below average. Pasturage is in fair condition. Rye, oats and barley are about average crops.

Acushnet (WM. S. DOUGLAS). — White grubs are eating potatoes badly and there are some army worms in oat fields. Corn is in good condition; no silos of any account in this section. Quality of hay crop good but quantity not up to the average. Fodder corn and millet are the principal forage crops and they are looking well. Market-garden crops in general are good. Potatoes are not up to former years in yield and prices are lower than usual. Apples good, pears limited, no peaches, quinces blighted and grapes a good crop. Pasturage is in good condition. Rye, oats and barley are about average crops. Haying has been delayed by bad weather and some hay damaged. Wild berries are very plenty.

PLYMOUTH COUNTY.

Hingham (AARON LOW). — Army worms, cut worms and striped squash bugs are all doing damage. The army worm has been very destructive on oats and grass in this vicinity but has not done much damage to vegetables. It has now gone into the pupa stage and is found very plenty among the grass roots. Corn is rather late but looking well. Hay was about two-thirds of a crop. The yield of market-garden crops is fair and prices low. Potatoes do not promise a full average crop. Apples are plenty but dropping badly, pears and peaches extremely scarce.

Brockton (DAVIS COPELAND). — Army worms and cut worms are doing some damage. Corn is in good condition and about one-fourth of the crop will go into the silo. Hay is about a three-fourths crop of good quality. Corn and Hungarian grass are the principal forage crops and are looking well. Market-garden crops are looking fairly well; quantity and price a little below average. Prospect good for apples and pears and poor for other fruits. Pasturage is short, owing to dry weather. Rye, oats and barley are about average crops.

Pembroke (NATHANIEL MORTON). — Potato bugs are doing the usual amount of damage. There is only one silo in this town. The hay crop was average in quantity and quality. Fodder corn is the principal crop raised for forage. Market-garden crops are average in yield and price; price for potatoes less than in former years. The prospect is very good for all kinds of fruit. Pastures are about average in condition but are now getting dry. Rye, oats and barley are about average crops.

Duxbury (A. M. GOULDING). — The army worm has ruined oats and corn to a considerable extent. Corn is a little later than usual; not more than one-third of the crop will be put into the silo. Hay crop a little short in quantity and of fair quality. Millet and fodder corn are the principal forage crops; both are looking well. Potatoes are a fair crop of good quality, but prices are lower than for years. Apples fair, no pears or peaches, quinces fair and cranberries good. Pastures are very short and dry. Rye, oats and barley are good crops where they have not been troubled by the army worm.

Lakeville (ELBRIDGE CUSHMAN). — Army worms are doing some damage. Indian corn is in very good condition; none will go into the silo. The hay crop is a little off both in quantity and quality. Hungarian grass, fodder corn, oats and peas and barley and peas are raised as forage crops and are all in good shape. Apples and quinces good, grapes and cranberries very good, no pears or peaches. Pasturage is in good condition. Rye was a little off from the average but oats and barley were fully up.

Wareham (A. B. SAVARY). — Squash bugs and cabbage worms are doing some damage. Corn is in good condition; no silos in this vicinity. The hay crop was about two-thirds of an average, but of good quality. A few oats and some fodder corn were put in to supplement the hay crop and both are doing well. Garden crops are about as usual both in price and condition. Apples are a fair crop, pears few, peaches very few. Pastures are in better condition than common. Rye, oats and barley are more than average crops.

BARNSTABLE COUNTY.

Bourne (D. D. NYE). — White grubs are eating potatoes badly ; mostly on turf land. Indian corn is in first-rate condition ; no silos in this vicinity. Hay crop about three-fourths of average and quality a little off. Corn fodder, oats, millet and Hungarian grass are raised for forage and are in very good condition. Potatoes are doing finely except on turf land. Apples half a crop, pears half a crop, scarcely any peaches, no quinces, very few grapes, cranberries looking finely. Pasturage is looking well. Oats and rye are good average crops.

Barnstable (JOHN BURSLEY). — The army worm and the white grub are doing some damage. Corn looks badly, much of it being worm eaten ; none will be put into the silo. Salt and fresh grass is quite well grown but good weather is needed to secure it. Oats, Hungarian grass and millet are the principal forage crops. Market-garden crops are in fair condition but very few are harvested as yet. Small crop of apples, pears and peaches, grapes and cranberries good. Pasturage is in good condition where grubs have not worked. Rye is a good crop ; oats heavy but cut for fodder. Cranberries promise an average crop.

Dennis (JOSHUA CROWELL). — The army worm has done considerable damage on late-flowed cranberry bogs, in many cases destroying all the new growth. Other bogs are looking well and the crop promises to be about an average one. Potatoes are being damaged by the white grub. Corn is in very good condition ; very little goes into the silo. Hay below the average in quantity but of good quality. Fodder corn is practically the only forage crop raised and is in good condition. Condition of market-garden crops fairly good ; yield and price about as last year. Apples a fair crop and pears a small crop. Pasturage is in very good condition.

Chatham (E. Z. RYDER). — Army worms are quite plenty in some localities, but are being handled very well by ploughing trenches. Corn is backward and very little will be put into the silo. Haying has progressed slowly and hay cured in poor condition owing to frequent showers ; crop smaller than in previous years. Very little done in forage crops. Potatoes backward and prices low. The cranberry crop promises to be large. Pasturage is in an improved condition. Rye, oats and barley are rather backward but are looking well and no doubt will yield an average crop.

Wellfleet (E. S. JACOBS). — Cabbage worms and corn worms are doing some damage. No corn is raised here and there are no silos. Salt hay is a small crop and fresh hay is good. The only forage crop is fodder corn and it is in good condition. Market-garden

crops are in good condition and those already harvested have been better than in former years in yield and price. There will be a good crop of cranberries, apples and pears. Pasturage is in good condition.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Potato beetles and corn worms are doing some damage. Corn is looking well where there are no worms; no silos here. The hay crop is below average in quantity but of good quality. A little fodder corn is about the only thing raised for forage. Potatoes are late and not many are harvested as yet. The prospect for apples is fair. Pasturage is in very good condition. Oats are a good crop.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER). — Cut worms and potato bugs are doing some damage. Corn is looking finely; no silos here. Hay is a two-thirds crop of good quality. Corn, Japanese millet and oats are the principal forage crops. All garden crops are looking finely but potatoes are not half a crop. Cranberries are looking very well. Pasturage is in very good condition. Rye did not do as well as usual but oats are a fine crop.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

THE ARMY WORM (*Leucania unipuncta*).

By A. H. KIRKLAND, M. S.,

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It would seem a matter of simple justice on the part of nature to eliminate from time to time the old and long-fought insect pests of the farmer as new and more dangerous ones appear, but that no such good fortune is in store for the agriculturist is shown by the reappearance this year of the army worm, accompanied by wide-spread damage throughout the State. The farmer and fruit grower may justly contemplate with anxiety such comparatively recent insect importations as the gypsy moth and San José scale, but when, in addition, it becomes necessary to combat serious devastations of the old-time insect pests, the romance and profits of agricultural pursuits are materially lessened, and particular emphasis attaches to the thought that eternal vigilance is the price of good crops. While by the time this paper reaches its readers the danger from the army worm will probably have passed, the possibility of outbreaks next year in those sections of the State where this pest has done but little damage this season indicates the necessity of disseminating information concerning the habits of the insect and the means of checking its devastations.

Life History.

The life history of the army worm is in brief as follows: the eggs (Fig. 1), of a glistening white color, are laid by the parent moth in rows of about twenty eggs each in the sheaths of grasses and grains, and on stubble, stacks of straw, etc. Often several rows of eggs are deposited on a single plant, and each female moth lays about five hundred eggs.

Upon hatching, these eggs give rise to small, dark, smooth-skinned caterpillars (true cut worms), which feed greedily upon grasses and grains. The full-grown caterpillar (Fig. 2) is about one and one-half inches in length, and has a dark dorsal stripe extending the whole length of the body. Following this stripe on each side of the body there are three narrow, fairly well-defined stripes, the first being grayish yellow, the second dark brown and the third, extending along the body just above the legs, of a rust-yellow color. The under surface is light brown. All the body colors are subject to much variation. In this stage the insect has the habit, common to other cut worms, of curling itself up when disturbed.



FIG. 2. — ARMY WORM.
Caterpillar. (From Department of Agriculture Report, 1879.)

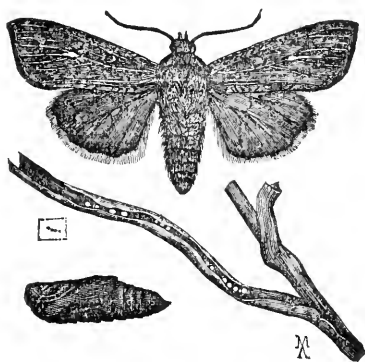


FIG. 1. — ARMY WORM.
Moth, eggs and pupa. (From Department of Agriculture Report, 1879.)

When full grown the caterpillars bury themselves in the soil to a depth of two or three inches and there transform into dark brown pupæ (Fig. 1) which, in the course of two or three weeks, give rise to winged moths. These moths (Fig. 1) are of a reddish brown color, expand about one and one-half inches and have near the centre of the fore wings a small white spot. The middle of each hind wing bears on the under surface a small black spot.

The natural breeding place of the army worm is said to be on the borders of swamps, where the grasses common to such places furnish suitable food for the insect, and from such localities in favorable years large numbers emerge to bring devastation upon surrounding fields.

There has been considerable controversy among entomologists concerning the number of annual broods of this insect. In the southern sections of the United States there are, according to Prof. L. O. Howard,* possibly as many as six annual broods, while in New England there are undoubtedly two broods yearly. This last statement may not hold true for the cranberry region of Cape Cod, where the army worm frequently causes much damage. From studies made on the Cape during 1894 Mr. C. P. Lounsbury† came to the conclusion that the insect was there probably single brooded.

The question of the stage in which the army worm passes the winter has an important bearing upon the number of annual broods. It is generally conceded that in this region the insects pass the winter as partially grown caterpillars (from the fall, or second, brood), which attain their full growth the following spring, transform and give rise to moths which lay their eggs in grass and grain.

These views concerning the number of annual broods and the question of hibernation find additional support in a peculiar feature of the outbreak of this season. Many of the fields worst damaged by the insect were those sown in the spring of this year. I found during the first week in July innumerable small larvæ not over one-third to one-half an inch in length scattered throughout these spring grain fields and at a greater distance from grass lands than these diminutive insects could possibly have travelled. Clearly then the eggs from which these insects came must have been laid in the grain fields by moths emerging from the hibernating brood of the previous season.

Food Plants.

The army worm is a general feeder upon grasses and grains, but when pressed by hunger will attack many garden vegetables and other herbage. It has this year been noticed feeding upon cranberry, oats, rye, barley, corn, herds-grass, orchard grass, red top, witch grass, peas, beans, beets, lettuce, cabbage, pig weed, yellow dock and purslane. Mr. C. A. Peters, a student of the Massachusetts Agricultural College, informs me that it also attacks barn-yard grass (*Panicum crus-galli*), shepherd's-purse and vetches. Figs. 3, 4 and 5 illustrate the army worm's characteristic method of feeding on rye and herds-grass.



* Circular No. 4, 2d series, U. S. Dept. Agr., Div. of Entomology, 1894.

Fig. 3. † Bulletin 28, Hatch Experiment Station, 1895.

The Army Worm in Massachusetts.

The history of the army worm in Massachusetts is of more than ordinary interest, since it affords an excellent idea of the periods of time usually elapsing between the outbreaks of this insect. It is recorded * that in 1632 "the worms made extensive ravages on the corn," while 1646 and 1649 "were caterpillar years." In 1666 "the Indian corn was eaten by worms." There is of course much doubt concerning the species of insect causing the above-mentioned damage to crops, but by some it is thought to have been the army worm. Later records are more authentic: 1743, — "Millions of devouring worms in armies, threatening to cut off every green thing." 1762, — "At last, when the corn was planted, millions of worms appeared to eat it up." 1770, — "A very uncommon sort of a worm . . . ate the corn and grass all as they went above ground, which cut short the crops in many places." Of this last-mentioned occurrence of the army worm the Rev. Grant Powers has written †: "In the summer of 1770 this whole section was visited by an extraordinary calamity, such a one as the country never experienced before or since, beyond what I shall here specify. It was an army of worms, which extended from Lancaster, N. H., to Northfield, in Massachusetts. They began to appear the latter part of July, 1770, and continued their ravages until September. The inhabitants denominated them the 'Northern Army,' as they seemed to advance from the north or north-west and to pass east and south, although I do not learn that they ever passed the high lands between the Connecticut and Merrimack rivers. They were altogether too innumerable for multitude. . . . There were fields of corn on the meadows in Haverhill and Newbury standing so thick, large and tall that in some instances it was difficult to see a man standing more than one rod in the field from the outermost row; but in ten days from the first appearance of this Northern Army nothing remained of this corn but the bare stalks!"

The farmers of Worcester and vicinity suffered severely from the ravages of this insect in grass lands during the summer of 1817, when it is recorded that "their progress



FIG. 4.

* Agriculture of Massachusetts. Chas. L. Flint, 1854.

† Historical sketches of the Coös County (N. H.), 1841.

is as distinctly marked as the course of a fire which has overrun the herbage in a dry pasture. Not a blade of grass is left standing in their rear. We are informed that about forty years ago the same kind of worm made great destruction in ploughed land, among spring grain, but particularly in fields of flax."

Of more recent occurrence are the sudden and destructive outbreaks of this pest in the years 1861, 1875 and 1880, when whole grass and grain fields were laid waste, and in some localities farmers suffered a total loss of their hay crop.

The appearance of the army worm this year seems general throughout New England, eastern New York and some parts of New Jersey. In this State its greatest damage is in localities bordering on streams, tide-water or marshes, an evidence that wet lands are the natural home of the insect.

Through the courtesy of Secretary Wm. R. Sessions I was enabled to visit infested estates at Hingham and Revere during the early part of July and to make a study of the conditions there existing. At the Jordan farm, Hingham, the oat fields suffered the most severely, the greater part of the leaves and heads being stripped from the grain. Grass lands and pastures in the vicinity were also infested but to a less degree. The foreman of the place, Mr. Parmelee, was advised to promptly cut all infested crops and later to furrow around these fields in order to prevent the migration of the pest. Unfortunately there was some delay in following out the last recommendation and as a result, as soon as the oats became partly dry, the worms migrated. Active measures, however, later on resulted in reducing the numbers of the insect.

The World's End farm, Hingham, suffered nearly as much from this pest but the devastation was checked by promptly mowing the crops. At Revere, the large Squire farm was found to be thoroughly infested, and here, as in other places, newly seeded land suffered the most. I was informed by the superintendent, Mr. A. Bart Hill, that the army worm first appeared in both the spring and fall rye fields and that having stripped the leaves from the grain, they next attacked the grass lands. As a result over one-third of the grass and grain crops on this estate were destroyed by the insect.

I am enabled to state, upon the authority of Mr. Frank D. Mills, Pittsfield, Mass., that the migrating masses of army worms seriously interfered with the moving of electric cars and, in some cases, of freight trains in the vicinity of Dalton.

The cranberry crop on the Cape has suffered this year severely from the pest, the damage to the crop in the three towns of Dennis, Harwich and Yarmouth being estimated at \$100,000.

Replies from correspondents indicate that a conservative estimate of the damage from the army worm to the cranberry,* grass and grain crops of the State the present year is at least \$200,000. Of this amount the greater part falls upon the cranberry growers, but many farmers have lost nearly their whole hay crop as the result of the work of this insect. The damage the army worm is capable of causing can be no better illustrated than by reference to the celebrated "army worm year," 1861, when the loss on grass and grain crops in western Massachusetts alone amounted to over \$500,000.

Remedies.

The army worm is a pest that never arouses popular attention until it is too late to prevent damage, and the fact that the insect only appears at somewhat extended intervals of time explains, in great measure, the lack of information among the farmers concerning the remedies to combat it. In this case, as in many others, prevention is better than remedy, and the occasional burning over of mowings and pastures cannot be too strongly advocated. This procedure destroys the hibernating insects. Where the army worm appears in abundance in grass and grain fields the crop should be cut at once. A furrow should then be ploughed around the infested field with the straight edge toward the land to be protected. As soon as the crop begins to dry, the worms commence to migrate, and crawling into the furrow are unable to climb up the straight side, unless the projecting grass roots afford a foothold, in which case the furrow should be deepened by spading. Holes dug in the bottom of the furrow furnish places in which the worms will collect, when they can be destroyed. Gen. W. W. Blackmar of Hingham has met with excellent success in destroying these insects by burning sawdust soaked in kerosene oil in the holes where the worms collected. A somewhat similar measure has been employed with good results by Mr. A. I. Hayward of Agawam.

Rolling infested fields has been recommended by many writers, and at my suggestion was thoroughly tried, but without anything like satisfactory results, although the ground was level and hard.

* I am indebted to Capt. N. B. Burgess of Yarmouth Farms for much interesting data concerning the ravages of the army worm in the cranberry growing region.

Infested corn fields may be sprayed early in the season with Paris green,* one pound to two hundred gallons of water, and, if properly done, without danger to stock feeding on the stover. Where the army worm is particularly abundant it may be advisable, in order to prevent migration, to spray grass land or to burn over

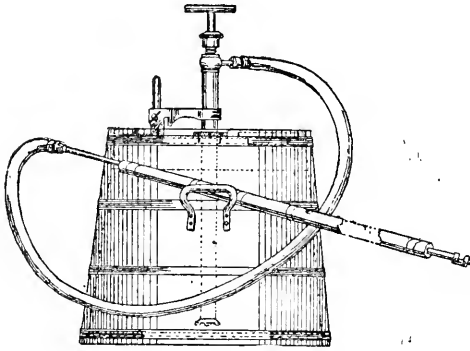


FIG. 6.

the fields at once. For this latter purpose the "Cyclone burner" (Fig. 6), originally designed for burning brush land infested by the gypsy moth, will be found of value. It may be made by mounting a small force pump on a ten or fifteen gallon tank, and connecting the pump by means

of a short piece of oil hose with a one-half inch iron pipe at the end of which a cyclone nozzle may be attached. The pipe should be about ten feet in length and have a wooden casing for convenience in handling. The tank should be filled with cheap crude oil. The oil is forced out at the nozzle, and by igniting the spray at the nozzle a flame results, which destroys every living thing with which it comes in contact. The cyclone burner may also be used to good advantage for destroying the worms collecting in the furrows.

On cranberry bogs Mr. Lounsbury† recommends wide water-filled ditches as the best means of checking the spread of the insect.

Natural Enemies.

Among the natural enemies of the army worm, birds are entitled to chief recognition. It is a well-known fact that smooth-skinned larvæ form a favorite article of the diet of insectivorous birds, and

* Arsenate of Lead or Arsenate of Barium, three pounds to one hundred and fifty gallons of water, may be substituted for Paris green. Arsenate of Barium is a promising new insecticide, which has been used experimentally with good results against the gypsy moth during the past summer. Its use as an insecticide was first suggested by the writer during the winter of 1895-96 as a result of investigations upon the different arsenates, and it has so far proved superior to any of the arsenical compounds now in use. Further experimentation, however, and, more particularly, the practical use of the poison on a large scale in the field will be necessary to accurately determine its value.

† Bulletin 28, Hatch Experiment Station, 1895.

a field infested by army worms makes a feeding ground to which the birds assemble from considerable distances, and there find food for themselves and young. The following list includes the birds I have seen feeding on the army worm the present summer: king-bird, Phœbe, bobolink, cow bird, red-winged blackbird, Baltimore oriole, crow blackbird, English sparrow, chipping sparrow and robin. Hens, turkeys and guinea fowls also devour large quantities of army worms.

Meadow larks, crows and flickers were seen apparently feeding upon the army worm, but I was unable to approach near enough to verify this observation. There was, however, an abundance of army worms on the ground in the places where these birds were feeding. At the Jordan farm several quail were heard in the swamp land adjacent to the infested field and I am informed by Gen. W. W. Blackmar that these birds have been seen feeding upon the army worm at his estate. At Marshfield a flock of quail was seen to feed for several days upon army worms in an infested field. The two species of blackbirds are apparently the greatest destroyers of these insects, but the good work done by the bobolink and English sparrow deserves mention. It is, however, very doubtful, if the services of the sparrow would equal those of the native birds it has displaced.

To verify observations an examination was made of the stomachs of a few birds taken in an infested field. The stomachs were found to contain army worms as follows: cow bird, remains of army worms; red-winged blackbird, three; crow blackbird, twenty-seven; six English sparrows, respectively four, three, five, four, none, three.

The garden toad ranks high as a destroyer of army worms. These batrachians were present in all the infested fields and seemed to feed nearly continuously. Dissections of three toads revealed nine, eleven, and fifty-five army worms in the respective stomachs.*

Certain parasitic flies and ground beetles usually attack the army worm and destroy large numbers, but these insects have been conspicuous by their absence in all localities visited. A single ground beetle (*Platynus sinuatus*) was noticed at Hingham feeding upon the small larvæ. Mr. A. I. Hayward of Agawam, to whom I am indebted for much valuable information concerning the habits of the army worm, writes me that the greater part of the pupæ of this insect found while ploughing the infested fields were parasitized,

* It is to be regretted that there is so little accurate knowledge concerning the food of the garden toad, a deficiency that I hope in some measure to supply at a later date. A large number of dissections of toads, made this year, show it to be a prime destroyer of cut worms and of nearly all the injurious insects of the garden.

thus showing that in some parts of the State the parasitic flies have been of material assistance in destroying this pest.

Causes Governing Outbreaks of the Army Worm.

In view of the abundance of the army worm during the present summer it may be profitable to briefly review the causes leading to such outbreaks and the influences which control the same. The army worm is an insect which appears as a pest only at extended intervals or times. This seems chiefly due to the warfare waged upon it by its natural enemies, mainly parasites, predaceous insects and birds, and also to some extent to climatic conditions.

Parasites often confine themselves to one host and their abundance is regulated by the numbers of the host, while birds as a rule seem to prefer the most abundant form of acceptable insect food. The climate affects insect increase either through the abundance or scarcity of the food supply or through conditions favorable or unfavorable to the multiplication of natural enemies.

The relationship between an insect and its natural enemies is seldom equally balanced; that is to say, the one form or the other is the more abundant in point of numbers or more effective by reason of peculiarities favorable to its increase. Hence, in years when the army worm is not present in any considerable number its parasites are limited in their multiplication by the scarcity of the host, while the birds give their chief attention to other insects more abundant. Thus the army worm increases slowly in numbers from year to year. Finally there comes a season especially favorable for its development and the worms appear in numbers sufficient to attract some degree of attention. They are followed the next year by a more or less wide-spread outbreak.* Then from the very fact of their great numbers there is an abundance of food offered their natural enemies, and the latter increase to such an extent as to destroy the greater part of the army worms, whereupon the insect apparently disappears. This shifting relation between the host insect and its natural enemies is best expressed by the term so frequently used by biologists, "the balance of nature," and this "balance" is the factor which controls all insect outbreaks. It would seem probable that the localities suffering most from the army worm this year will be exempt next season

* I am informed by Secretary Wm. R. Sessions that from careful observations extending over a considerable period of years he has reached the conclusion that army worm outbreaks usually follow a warm dry spring. It seems quite probable that, as pointed out by Mr. Sessions, such conditions of warmth and dryness are favorable to the emerging of the moths and the hatching of the eggs.

although it is possible that a sufficient number of the insects may have survived in some places to cause some degree of damage. In the parts of the State where but little damage has resulted from the army worm this year there is a greater chance that the pest will be abundant next season, and here particular attention should be given to the burning over of fields. When the present outbreak subsides there probably will not be another one for several years.



SERIES OF 1896.

BULLETIN No. 4.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF AUGUST, 1896.

ISSUED BY

WM. R. SESSIONS,
SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF AUGUST, 1896.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Sept. 1, 1896.

Bulletin No. 4, Crop Report for the month of August, is herewith presented. Particular attention is called to the article on "The Crow in Massachusetts," by the ornithologist of the Board of Agriculture, which is printed at the end of this bulletin.

PROGRESS OF THE SEASON.

Report No. 140, New Series (August, 1896), of the Statistician of the United States Department of Agriculture, indicates an improvement in the condition of corn over that reported last month of 3.6 points, or from 92.4 to 96. A bountiful harvest is expected in Wisconsin, Minnesota, Iowa, Kansas and Nebraska.

The condition of spring wheat has fallen since July report from 93.3 to 78.9, a decline of 14.4 points. It has suffered from the army worm in Wisconsin, so much so that in the north-eastern part of the State harvesters have been run night and day to secure the grain before its complete destruction. The crop has also been damaged in several States by rust and heavy rains.

The condition of oats has fallen to 77.3 per cent from 96.3 July 1, and the decline has occurred in all parts of the country, being due to the army worm, chinch bugs, heavy rains and rust.

The condition of spring rye also has fallen within the last month, being 88 August 1, as against 98.6 July 1.

The condition of barley has fallen 5.2 points since July 1, or from 88.1 to 82.9. In California, the principal barley State, the condition has improved from 67 to 73.

The acreage of this year's buckwheat crop is about the same as last year's acreage, and the condition of the crop is

96, which excels last year's condition by 10.8 points. Little damage to the crop is reported.

The condition of Irish potatoes has fallen from 99 to 94.8 since July 1, or 4.2 points. This decline is general throughout the country, the chief exceptions being some of the New England and northern States and California.

The average condition of tobacco has fallen 5 points since July 1, and is now 86.5. The chief cause lowering the condition is seen to be the decline in the heavy producing States,—Kentucky, North Carolina and Ohio. In other important sections conditions are high.

The total area of hay is 97.9, compared with the preceding year. Except Vermont's increase of 1 per cent there is a moderate decrease in all the New England States, as there is also a more heavy one in all the middle and southern ones except West Virginia and Florida, which are not considerable producers. Of the new States, Nebraska and South Dakota are becoming heavy producers of hay.

The condition of timothy is 87.5, against 69.9 a year ago. Several States of large production report very low condition.

The figures in regard to product of clover show 81 per cent of a full crop. Nearly all of the large producing States, however, report percentages higher than those of last year.

The average condition of pastures is 93.9, or 6.1 below the normal, yet 16.1 points above that of a year ago.

The general condition of apples advanced during July from 64.6 to 65.7,—a gratifying indication of sustained crop prospects. This general average covers all kinds of apples, early and late, in all sections of the country, commercially important or unimportant as producers. The chief supply of winter apples is the northern region, where conditions, both July 1 and August 1, were in the main high. In other parts of the country, with a few exceptions, the conditions are low.

Present returns show generally reduced condition of peaches. In Delaware the early crop was nearly ruined by curculio and "yellows," and fruit on the trees is badly stung there and in Maryland. In Michigan and Ohio excellent crops are indicated. In New Jersey, Virginia, Georgia and California percentages indicate less than half a crop.

The condition of grapes is generally high.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES WEATHER-CROP BULLETINS.]

Week ending August 3. — Week warmer than usual in all districts east of the Rocky Mountains, with the exception of limited areas in the upper Missouri valley, eastern Maine and extreme southern Florida, where it was slightly cooler than the average. Week also warmer than usual in northern California, but elsewhere on the Pacific coast and generally throughout the plateau regions the week was cooler than usual. Over much the greater part of the country the weekly rainfall was below the average. General condition of corn in the principal corn States continues excellent. Spring-wheat harvest well advanced in the southern portion of the spring-wheat region, and the early sown is being cut in the northern portion. Tobacco continues in good condition, except in the Carolinas.

Week ending August 10. — Week exceptionally warm in all districts east of the Rocky Mountains, except along the immediate Atlantic and Gulf coasts, where, although warmer than usual, the departures from normal were not especially marked. Over the interior and eastern portions of Washington and Oregon and throughout the plateau regions and almost the whole of California it was cooler than usual. The maximum temperatures over the greater portion of the country east of the Rocky Mountains were unusually high throughout the week. More than the usual amount of rain fell in the lake region, over portions of the upper Mississippi and Missouri valleys, northern Montana and over the greater part of Washington. Throughout the Atlantic coast and gulf States, the central Mississippi and lower Ohio valleys less than the usual amount of rain fell. The cotton crop has deteriorated generally throughout the cotton belt. In the great corn States of the central valleys and north-west the crop is maturing rapidly under most favorable conditions. The general condition of tobacco is promising. The extremely hot weather has interfered with fall ploughing. Light frost occurred in eastern Idaho on the morning of the 5th, causing little or no damage.

Week ending August 17. — Temperature generally in ex-

cess throughout the country. The maximum temperatures of the 11th and 12th at numerous stations in New England were higher than any previously recorded during the second decade of August since their establishment. The northern portions of the gulf States also experienced maximum temperatures equalling or exceeding former records for the second decade of August. Throughout the southern States and over the greater portion of the lake region and New England less than the usual amount of rain fell, and no appreciable amount fell in the Pacific coast districts. In the southern States the week was very unfavorable, owing to continued excessive heat and general lack of rain. The deterioration of cotton has continued over the greater portion of the cotton belt. In the southern States corn has suffered further injury and only a very light crop in that section is promised. The general outlook, however, is for an exceptionally fine crop in the principal corn-producing States. Light frost occurred in eastern Idaho and heavy frost in western Montana, where considerable damage was done to vegetables.

Week ending August 24. — Week warmer than usual in the south Atlantic and gulf States, and in the middle and north Pacific coast regions. Over the eastern Rocky Mountain slope, the central valleys, lake region, middle Atlantic States and southern New England the week was cooler than usual. Generally there was less than the usual amount of rain over the northern districts eastward of the Missouri valley, in the middle and south Atlantic and gulf States, with the exception of southern Florida and portions of Texas. There was more than the usual rainfall in the Ohio valley, over the central and southern Rocky Mountain districts and over a few local areas. The corn crop is maturing rapidly and cutting is progressing as far north as Minnesota, Wisconsin and Michigan. The weather conditions the past week have been favorable for cotton picking. Much tobacco has been cut and housed. Spring-wheat harvest is now nearing completion over the southern portion of the spring-wheat region. In the central valleys and in the middle Atlantic States the condition of the soil has been very favorable for ploughing for fall seeding and much ploughing has been done.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending August 3. — New England. Boston: Plenty of rain and heat; all crops growing extra fast; very slight damage by frost in north portion on the 1st; damp weather favorable for spread of potato blight, which is appearing in south; weather unfavorable for completing hay and grain harvest, and some is getting over-ripe.

Week ending August 10. — New England. Boston: Hot and sultry, with rain enough to keep crops making unusually rapid growth; tobacco very large and forward, cutting begun; corn and second grass crops promise to be heavy; pastures green and good; apples large crop and excellent quality: potato blight increasing.

Week ending August 17. — New England. Boston: First of week very hot, last part cooler; plenty of sunshine and moderate rainfall, but unevenly distributed; crops growing and maturing fast; thrashing begun and grain yields well; cranberries sunburned badly; apples very fine and large crop.

Week ending August 24. — New England. Boston: Cooler, with light frost, but no damage; rain generally sufficient for surface needs and crops doing well, but subsoil and water supplies need heavy rains; some damage in Vermont by hail on the 18th; tobacco cutting being pushed, fine crop and in excellent condition; onion seed being cut, fair crop.

WEATHER IN MASSACHUSETTS FOR THE MONTH OF AUGUST.

August has been a very favorable month, from an agricultural point of view. It opened with plenty of heat, sunshine and moisture, and with all crops pushing ahead fast. It was a little too wet and humid for potato vines, and they blighted considerably in the south, while mildew appeared on grapes and peas. Unusually hot and sultry weather continued over the second week of the month, and corn, tobacco and such crops made a remarkably rapid growth. It was too hot for cabbage, and cranberries were badly scalded. Apples made a very rapid growth.

The last half of the month has been somewhat cooler and dryer, with plenty of sunshine for curing grain and late hay and for ripening crops. Except in Bristol County there has been enough rain for surface needs till at the very end of the month, when it is getting quite dry. There has been a marked absence of severe local storms and no continuous rains, so that streams and wells are getting very low and the subsoil is very dry. It is too dry to plough to best advantage, and in many places fall seeding is being delayed.

The cooler, dryer weather of the last of the month checked the potato blight, and yet did not prevent corn from keeping up its rapid growth. Tobacco has been mostly put in, and is in splendid condition. It is singularly free from damage by hail or by unfavorable weather.

The conditions have been favorable for the growth of grass after the first crop was cut, and fields are getting a good start for next year's hay crop. Pastures have been very good, but the feed is short in eastern counties at the end of the month.

The month has been warmer and drier than the normal.

In the circular to correspondents returnable August 25 the following questions were asked:—

1. What is the condition of Indian corn?
2. What is the prospect for rowen as compared with former years?
3. What is the prospect for late potatoes and have you noticed blight or rot?
4. What is the condition of tobacco and how does the crop compare with a normal crop?
5. What is the prospect for apples, pears, peaches, grapes and cranberries?
6. What is the condition of pasturage in your vicinity?
7. How have oats and barley compared with last year's crops?
8. Do your farmers pay much attention to poultry and what proportion does the income derived from poultry products bear to that derived from the dairy?

Returns have been received from 147 correspondents, and from them the following summary has been made up:—

INDIAN CORN.

Indian corn now promises to be a very large crop, nearly if not quite equal to the phenomenal crop of last year. It is still a little late in some localities, but should mature in good shape unless a killing frost occurs unusually early in the season. The stover is reported as luxuriant and the crop is also well set with ears. Sweet corn is also reported to be a good crop.

ROWEN.

Taking the State as a whole, rowen promises better than for several years. In the four western counties the condition is better than in other portions of the State, there being more complaint of injury from drought in the east. The crop appears to be best where the first crop was cut late. On Cape Cod there is much complaint of injury to grass roots by the white grub, and the same complaint comes from other isolated localities. The same insect is also reported as having done considerable injury to corn, potatoes and strawberry plants.

LATE POTATOES.

Late potatoes will not be an average crop, owing to the combined effects of drought in the early part of the season, blight and the ravages of the white grub. Blight is general, and no section seems to be free from it. Rot has not appeared to as great an extent, but there are still quite a number of complaints of its presence.

TOBACCO.

Correspondents are practically unanimous in reporting tobacco as the best crop for many years. It is a large growth, with a large leaf of good color. Cutting is now practically completed, and the weather has been excellent for curing the crop. That cut early has already cured in good shape.

FRUITS.

Apples still promise an unusually good crop. They have dropped but little, and about the only fault mentioned is a

tendency toward small size, because of the great number on the trees. As indicated in all previous reports, there will be very few pears and practically no peaches. Grapes promise a full crop, though they are probably a little later than usual. The cranberry crop has fallen off in condition during the month, but an average crop is still promised. The hot weather of the early part of the month did much damage, scalding the berries on some bogs. Complaint is also made of the ravages of insects.

PASTURAGE.

Pastures are generally reported as in good condition, frequent rains having kept them green and growing well. Some correspondents say, however, that pastures have not yet recovered from the drought of the past two years. About the only reports of poor condition come from the south-eastern portion of the State.

OATS AND BARLEY.

Oats and barley are good average crops where allowed to mature the grain. The greater portion are cut for fodder, and both crops were very satisfactory in this respect.

POULTRY KEEPING.

The answers to the question on poultry keeping were extremely varied. In most sections but little attention is paid to poultry, it being regarded as rather a side issue. Still, the general opinion seems to be that, even with the desultory care it receives, poultry pays a better return on the money invested than does the dairy. In the south-eastern portion of the State much attention is paid to poultry, and the income derived from it seems to be about equal to that received from the dairy. The answers to the latter part of the question are too varied and meagre to warrant the making of an estimate. However, enough has been learned to justify the statement that, outside the portion of the State already indicated, the proportion borne by the income derived from poultry products to that derived from the dairy is generally very small.

NOTES OF CORRESPONDENTS.

[Returned to us August 25.]

BERKSHIRE COUNTY.

Egremont (J. H. ROWLEY). — Corn is in good condition, though about ten days late. The prospect for rowen is better than for the last two years. All potatoes are blighted and the yield is light. Apples will be a good crop. Pasturage is in good condition; grass fresh and growing. Oats and barley are average crops, though insects and rust have injured oats. Poultry raising is on the increase.

West Stockbridge (WM. C. SPAULDING). — Corn is first-rate, except on very dry or poor land. Rowen is better than an average crop. Potatoes are blighted and there is some rot, though it is not bad as yet. Apples are very good; few pears, peaches or grapes and no cranberries. Pastures are very good, especially where not fed too closely. Oats are said to be a better crop than last year. Not much attention paid to poultry. The hot weather appears to have affected early apples; about the 15th they were dropping fast, but are not dropping so much since it became cooler.

Dalton (J. S. BARTON). — Indian corn is in very fair condition. Rowen promises a full average crop. Potatoes looked well the first part of the season, but blighted later, and there is now some complaint of rot. Apples good, not many pears, no peaches, grapes poor and no cranberries. Pasturage seems very good except on dry land. Oats are a better crop than last year. A few farmers pay attention to poultry, but it is not general.

Windsor (H. A. FORD). — Indian corn is fully as good as usual. The outlook for rowen is good. Potatoes are rather light, being not much over 50 per cent of last year's crop; little rot. Apples will be quite a good crop. Pastures have not been so good for several years. Oats and barley are about average crops. Not much poultry in this town.

Hancock (C. H. WELLS). — Corn is in excellent condition. Rowen promises to be better than an average crop. Most potato

vines are blighted and the crop is shortened ; some rot. Full crop of apples, few pears, no peaches, no cranberries and few grapes. Pasturage is in very good condition. Very little poultry is cared for in a business-like way, though your correspondent and a neighbor have each built a poultry house this season.

New Ashford (ELIHU INGRAHAM). — Indian corn is in fine condition. The rowen crop is the best for years. Prospect for late potatoes fine ; no blight noticed as yet. There is a fair crop of apples, but few pears. Pastures are in the best condition for a number of years. Oats and barley are better crops than last year. Much attention is paid to poultry, the value of poultry products being one-eighth that of dairy products.

FRANKLIN COUNTY.

Monroe (D. H. SHERMAN). — Indian corn is looking well ; most of it glazed. Rowen more than an average crop. Potatoes will be light ; most pieces are blasted and there is some rot. Light crop of apples ; no small fruits except berries, which are plenty. Pastures are in very fair condition. Most farmers keep from fifteen to one hundred hens, and I think the income from poultry is more than one-half that from the dairy.

Buckland (C. E. WARD). — Corn is in excellent condition. Rowen is a fair average crop when compared with the last three years. Potatoes are much below last year and there is some blight. Apples a good crop ; few pears and no peaches. Pasturage is in full average condition. Oats and barley are better crops than last year, but are cut for fodder mainly. Farmers are paying more attention to poultry each year, but the percentage is very small as compared with dairying.

Ashfield (CHARLES HOWES). — There is a big growth of corn fodder and the ears are filling out well. The prospect for rowen is the best for several years. Potatoes are very uneven and generally poor ; some blight, but no rot. Tobacco is looking finely and some are harvesting. Apples are plenty and of very fine quality ; other fruit scarce. Pasturage is very good for this season. Oats and barley are mostly cut for hay, but the few pieces left to ripen yield very well. With good care, it is claimed that poultry pays better than the dairy, and poultry raising is gaining among our farmers.

Deerfield (CHAS. JONES). — Indian corn is in good condition. Rowen promises to be more than an average crop. There is considerable blight on potatoes, but no rot. The tobacco crop is above the average and is one of the best for years. Apples are

plenty, grapes a fair crop, no peaches. Pasturage is in good condition. Oats and barley are better crops than last year. But little is done here in poultry raising.

Northfield (T. R. CALLENDAR). — Corn is in good condition, well eared and fodder heavy, though a few days later than usual. More rowen will be cut than for many years. Blight is almost universal on potatoes; no complaint of rot as yet. Tobacco is of fine growth, free from imperfections and promises to be much above normal if cured well. Apples are heavy, pears light, no peaches, and grapes somewhat injured by mildew. Pasturage is unusually good for the time of year. Oats and barley are fully up to last year's crops. Very little is done with poultry, not enough to compare with dairying. The season has been remarkably favorable for all crops, especially those grown on light land.

Sunderland (J. M. J. LEGATE). — Corn promises to be a heavy crop, though perhaps a little later than last year. Rowen will be below the average, owing to the spring drought. Potatoes are more than an average crop. Have heard of no rot, but the blight is general, though not coming on early enough to materially injure the crop. Tobacco is the best crop since 1892, being fully as good as that crop and far above the average. Apples good; no pears, peaches or cranberries; grapes looking well, but late. Pastures are in good condition. No oats or barley raised. Not much attention is paid to poultry.

HAMPSHIRE COUNTY.

Prescott (W. F. WENDERMUTH). — Indian corn promises to be a full crop. More rowen will be harvested than in the past three years combined. Late potatoes are a light crop, with a good deal of blight. There will be full crops of apples and grapes, but no other fruit. Pasturage is in extra good condition for the time of year. Oats and barley are 15 per cent better than last year's crops, but there is some rust. Poultry is growing in favor, and holds the proportion to dairying of one to four. Late cabbages are looking well.

Belchertown (H. C. WEST). — Indian corn is a full average crop. Much ground was mowed over too late for a crop of rowen, but that cut early shows a good crop. Potatoes promise fairly; some blight and rot. Apples a large crop of good quality, few pears, no peaches, grapes good. Pastures are green and growing, but have not fully recovered from the two past dry years. Oats are hardly up to last year, but barley is fully up. Very few farmers pay much attention to poultry.

South Hadley (H. W. GAYLORD). — Corn is one of the best crops ever grown in this vicinity. Rowen will be an average crop if given the average time to grow; first crop late in finishing. Blight affects some pieces of potatoes but is not general; prospect for an average crop. Only one piece of tobacco is grown in this town, and that is as good as I ever saw. Apples fair, few pears or peaches, grapes good. Pasturage is in full average condition. Oats and barley are full average crops, but are all cut green for hay. Only three men in town make a specialty of hens, and they report the profit from one hundred fowls to be equal to that from eight or nine cows.

Northampton (D. A. HORTON). — Corn has come forward fast, and if frost holds off will be a large crop. Rowen was never better on good land. The indications now are that late potatoes will be a light crop. Tobacco is to all appearances a fine crop and is nearly all harvested. Apples a large crop, no peaches, grapes fair. Pasturage is in good condition. Oats are a two-thirds crop; not much barley raised. The early drought induced many farmers to put in corn for fodder, which is looking well, and quite a number are building silos. Most of these are built in circular form.

Southampton (C. B. LYMAN). — Corn is in very good condition. Rowen is better than for two or three years past and promises to make up in a measure for the short hay crop. Potatoes are not as good as last year and a good deal of blight is noticed. Tobacco never looked better, being fully 10 per cent above the average in condition. Apples a good crop, no pears or peaches, grapes very full. Pastures are in very good condition and it is not necessary to feed at the barn. Oats are more than an average crop. Only a very few pay special attention to poultry.

Worthington (C. K. BREWSTER). — Corn is in very good condition. Rowen is better than for the last two years. The prospect for late potatoes is fair, but there are some symptoms of blight. Apples and pears are good crops; few grapes and cranberries raised. Pastures are in good condition, the frequent rains having kept feed growing. Oats and barley are fully as good as last year. The income derived from poultry is probably not more than 5 per cent of that derived from the dairy. The weather has been unfavorable for harvesting Hungarian grass.

HAMPDEN COUNTY.

Blandford (E. W. BOISE). — Indian corn is in very extra condition, fully 110. Rowen is 25 per cent above an average crop. Potatoes are fair; tubers few, but of good size; little blight. Apple trees are loaded, but there is no other fruit. Pastures are

in fair condition, but are not yet recovered from the drought of the two past years. Oats and barley are fully 10 per cent above last year's crops. Very little attention is paid to poultry raising. The season on the whole is much above the average. Forage crops were much above the average and barns are generally well filled.

Westfield (C. F. FOWLER). — Indian corn will be a full average crop. A good crop of rowen will be cut on good land. Late potato vines are nearly dead now; early ones blighted badly. Tobacco never looked better and that housed is curing down finely. Apples a full crop; grapes, pears and peaches light. Timely rains have kept pastures in good condition. Poultry has taken the place formerly occupied by the pig upon the farm, and with many is giving a much better return.

West Springfield (J. N. BAGG). — Indian corn is in remarkably good condition. The prospect for rowen is good. The prospect for late potatoes is good and there is neither blight nor rot. The tobacco crop is the largest and fairest I ever saw. Apples good, pears scarce, no peaches, grapes and cranberries light. Pasturage is in good condition. Little attention is paid to poultry raising and the value of the products is much less than those of the dairy.

Ludlow (C. B. BENNETT). — Indian corn is an A No. 1 crop. Rowen promises to be better than usual. Late potatoes are nearly all blighted and are rotting some. Apples good, pears light, no peaches, grapes very plenty. Pasturage is in good condition. Oats and barley are fully up to average crops. There is some poultry raised, but the value of the products is not more than one-tenth those of the dairy.

Hampden (J. N. ISHAM). — Corn is in splendid condition, growing and maturing fast. The rowen crop will be more than double that of last year. Most late potatoes promise well, but blight has injured some varieties. Tobacco is above the average crop. The prospect for apples and grapes is good, but other fruits will be light. Pastures are holding out green and are in good condition. Oats are a much larger and heavier crop than last year. Our farmers generally give special care to their poultry and the income from this source is more than one-tenth that from the dairy.

Wales (C. F. CRAWFORD). — Indian corn is nearly ripe now and will be an excellent crop. Rowen will make a fair crop. Potatoes are an average crop; no blight or rot. Apples and grapes are very large crops, pears average, no peaches. Pasturage is getting very short now. Oats are very good and equal to

last year's crop. Poultry is of small importance, though the income derived may be 5 per cent of that derived from the dairy. Wells and brooks are very low, although the surface of the ground is well watered.

WORCESTER COUNTY.

Dudley (J. J. GILLES). — Indian corn, which was late in the early part of the season, made unprecedented growth during the late hot spell, has eared out well and is fully up to the average in condition. The prospect for rowen is also an average with former years. Late potatoes are rather small in size, vines blighted, but no rot as yet. Apples set an immense crop and it is remarkable how few have dropped off. Pears and peaches are a failure. Pasturage is in good condition. Oats made a heavy growth, but nine-tenths of the crop was cut green.

Oakham (JESSE ALLEN). — Corn is in good condition and has a very rank growth. The prospect for rowen is much better than usual. Blight has killed the potato vines and the crop will be light. Apples and grapes are good. Pastures are in excellent condition. Oats and barley are full average crops. Considerable poultry raised, many finding it more profitable than the dairy; the income derived is perhaps one-sixth that derived from the dairy.

Petersham (S. B. COOK). — Corn is in prime condition, there being a large growth of stalk and the ears set well. There will be much more rowen than usual. There is complaint of a small yield of potatoes; blight and rot only slight as yet. Apples and grapes are abundant, but there are very few pears and peaches. Pasturage is in prime condition. Oats and barley are fully equal to former crops. There is considerable interest in poultry; should say the income derived from it is one-half that from the dairy.

Princeton (PRESTON KNIGHT). — Corn is in very good condition. Rowen will average well with previous years. Many fields of potatoes have blighted badly. Apple crop heavy and very fair, pears scarce, some grapes and cranberries. Pasturage is in very good condition. Oats and barley are fully 10 per cent better than last year's crops. Not much attention is paid to poultry. In my case poultry pays fully 50 per cent better than the dairy.

Fitchburg (DR. JABEZ FISHER). — Indian corn is in very promising condition. There will be little or no rowen. Drought will shorten the potato crop considerably. Apples very fine, pears meagre, no peaches, grapes very good. Pastures are only in fair condition. Everyone keeps a limited amount of poultry, mostly at a fair profit for the amount invested. In this locality the ground

was dry at the beginning of April, and, though there has been a fair amount of rain through the season, yet there has not been enough at any one time to penetrate to the depth of a foot, and much vegetation has suffered thereby.

Clinton (P. B. SOUTHWICK). — Corn is about an average crop, but not equal to last year. Rowen promises to be considerably above the average. Late potatoes are below last year; some blight and a little rot. Apples a large crop, very few pears, no peaches and grapes good. Pastures look very well. Oats and barley compare favorably with last year. Not much done with poultry; interest very small as compared with the dairy. Crops of all kinds grow very rapidly and are ripening up very early compared with former years.

Worcester (H. R. KINNEY). — Corn is rather late, but is doing well. Rowen will probably be better than the average for the last few years. Potatoes are setting heavily and are blighting some. Apples and grapes promise a full crop. Pasturage has been fair, but begins to suffer for want of rain. Oats and barley were all cut green and the crop was good, though secured in poor condition on account of rain. Poultry is not kept extensively here, some farmers not keeping enough to supply their own tables. Apples are very smooth and free from worms, but many trees are so full that they will probably be rather undersized.

Westborough (B. W. HERO). — Indian corn is in good average condition. There will be about an average crop of rowen. Late potatoes promise a good crop; have noticed neither blight nor rot. Large crop of apples of extra quality, pears and peaches a failure, average crop of grapes and cranberries. Frequent showers have kept pastures in excellent condition. The acreage of oats and barley is about one-half that of last year. But little attention is paid to poultry. The income derived from it is about 10 per cent of that derived from the dairy.

Blackstone (L. R. DANIELS). — Corn is fully an average crop. Rowen is an average crop, better than that of last year. The tops of early potatoes blighted August 1; late, still green; no rot. Crop of apples and pears very large, grapes and cranberries average, no peaches. Pastures are in good condition for the time of year. Oats and barley did well as fodder crops; little or no grain grown. Most farmers keep as many hens as their situation will warrant, and it is generally remarked that the profit from twenty-five hens is about equal to that from one cow. French turnips are a staple crop with marketmen, bring about 50 cents per bushel and are looking well.

MIDDLESEX COUNTY.

Marlborough (E. D. HOWE). — Corn is 100 per cent of a full crop. Rowen promises to be a very good crop. Late potatoes are nearly a full crop and no blight or rot has appeared. Apples are 110 in condition, pears 5, peaches 0 and grapes 100. Pasturage is in better condition than usual. A few have gone into poultry quite extensively, but the majority still stick to the dairy.

Framingham (H. S. WHITEMORE). — Corn is in good condition and fully up to the average. Rowen will not be over 50 per cent of a crop, owing to hot weather. Potatoes are blighting and some rot is complained of. Apples are abundant, very few pears, no peaches, grapes a large crop, cranberries good. Pastures are very short and dry and farmers are obliged to feed at the barn. Oats and barley are average crops, but are mostly cut and cured for hay. More attention is paid to poultry now than formerly, and I think it the best-paying investment on the farm. We need rain here, as everything is drying up.

Weston (H. L. BROWN). — There will be very little rowen, as it has been too dry. Potatoés promise well and there is no blight. Apples a large crop, few pears, no peaches, grapes good, only a few cranberries. Pasturage is short. Oats and barley are raised only for fodder, but late barley will be short unless we have rain soon. There are a few poultry farmers who give their whole attention to it, but the business is small as compared with the dairy. Apples are now commencing to drop. Squashes are poor and are dying badly. Sweet corn is looking well and so is late cabbage. Millet and Hungarian grass have made a good growth and will give a fair crop.

Carlisle (E. J. CARR). — Indian corn is in good condition. Rowen promises to be about an average crop. Late potatoes have looked well, but are now blighting and there is danger of rot. Apples, grapes and cranberries are looking well; few pears and no peaches. Pasturage is good. Oats and barley are above average crops and much better than last year. Farmers pay much attention to poultry, and the profits are very much greater than from the dairy according to the money invested.

Billerica (J. N. PARDEE). — Corn has been growing fast of late, but some fields show serious effects from drought. Rowen is in poor condition, owing to dry weather. Early potatoes are rather free from blight or rot. Apples are a fine crop, but may be undersized, owing to the great number on the trees. We have few good pastures and feed is short. Oats and barley are heavier crops than usual and are free from rust. Very little poultry is

kept, and the products are not worth comparing with those of the dairy. More rain is sadly needed ; springs are dry and wells very low.

Winchester (MARSHALL SYMMES). — There will be a very light crop of rowen. Potato vines are nearly dry. Apples a large crop, few pears, no peaches or cranberries. Pastures are very short, there not having been enough rain to make them good. Not much attention is paid to poultry, and their products are not more than 10 per cent in value of those of the dairy. There has been so little rain and the heat at times has been so great that tomatoes, cabbages and celery have suffered. There have been frequent light showers, but all the time the springs have been getting lower, till some are now entirely dry.

ESSEX COUNTY.

West Newbury (JOHN C. TARLETON). — Indian corn never was better in this vicinity. Rowen promises to be a good crop. A great many pieces of potatoes are blighted and the prospect is not as good as last year. Apples are a very large crop, no pears or peaches to speak of, grapes and cranberries a fair crop. Pasturage is in very good condition. Oats and barley are mostly cut for fodder and were very good crops. The income derived from poultry is about one-fourth that derived from the dairy.

Groveland (ABEL STICKNEY). — Corn is looking well and the prospect is for more than an average crop. Rowen is quite good and an average crop is expected. Potatoes are in good condition ; no rot, but some blight. Apples good, pears poor, no peaches and grapes good. Pasturage is short, but the condition is fair for the season. Oats and barley were cut green and compared well with last year. Poultry pays a larger per cent on the investment than does the dairy.

North Andover (A. R. STEVENS). — Indian corn is in splendid condition. Rowen will not be more than a three-fourths crop. There is some blight on potatoes and a little rot. Apples and grapes are good crops ; not many pears and no peaches. Pasturage is in very fair condition. Oats and barley have been average crops. Very few about here pay much attention to poultry.

Wenham (ALVIN SMITH). — Indian corn is in good condition. Rowen promises to be better than an average crop. Potatoes are good and there is no rot. Apples and cranberries are good crops. Pasturage is in very good condition. Oats and barley are about average crops. Very little attention is paid to poultry, our farming being mostly dairying and hay raising.

Marblehead (W. S. PHILLIPS, JR.). — Indian corn is fully up to the average in condition. The present condition of rowen promises a heavy cut. Rot on potatoes has not yet shown itself and the crop bids fair to be a full average. Apples a fair crop, few pears and grapes, and no peaches. Pastures are in better condition than at this time for many years. Poultry raising is conducted separately from general farming, as they don't mix well. Most farmers' wives keep a few hens, sufficient for home use.

NORFOLK COUNTY.

Medway (MONROE MORSE). — Indian corn is in very good condition. I think rowen will be an average crop. There is some blight on potatoes and rot may show later, though the crop is now harvested. Apples are excellent, few pears, no peaches, grapes fair. Pastures are not often good at this season and this year is no exception. Oats and barley are grown only for fodder; oats made a good growth.

Franklin (C. M. ALLEN). — Corn promises to be a good crop. Rowen is not over 60 per cent of a full crop. Potatoes are a fair crop and there is but little blight. Apples are 10 per cent above the average, pears a three-fourths crop, few peaches, grapes good and cranberries fair. Pastures are dried up. Oats and barley were better crops than last year. There are no large poultry keepers here, but if it pays any profit at all it is more than that from the dairy. The season has been too dry for all crops. Apples are not filling out as they should and are dropping badly.

Cohasset (E. E. ELLMS). — Corn is in good condition. Rowen promises to be better than in former years. Potatoes are very good and there is no blight or rot. Apples, grapes and cranberries are all great crops. Pasturage is in extra fine condition. Oats and barley are about average crops. Our farmers get more profit from poultry than from the dairy.

BRISTOL COUNTY.

Easton (H. M. THOMPSON). — Corn has been injured somewhat by the unusually dry weather. Rowen has also suffered from drought. Potatoes on low land will average well; no blight or rot. The prospect for all kinds of fruit is good. Pasturage is in poor condition. Oats and barley compare favorably with other years. Ducks are quite extensively raised here. The income from poultry keeping in this immediate vicinity equals if not exceeds that from the dairy.

Raynham (N. W. SHAW).—Corn is in very good condition. Rowen will not be as good a crop as in many years. Potatoes are a medium crop; blight is quite prevalent. Apples a large crop, no pears or peaches, grapes fair, cranberries good. The dry weather and the white grub have injured pastures very much. The white grub has also done much damage to strawberry fields and in some pieces more than half the plants are destroyed. Oats and barley are fairly good crops where raised. In many cases the income from poultry keeping is fully as much as that from the dairy.

Dighton (J. N. PAUL).—Indian corn is in good condition. Rowen promises to be a good crop. No late potatoes grown here. Apples good, grapes good, no pears or peaches. Pastures need rain. Much attention is paid to poultry, and the income from this source is as large as that derived from the dairy. Strawberry vines are looking well, and the acreage is larger than last year.

Westport (A. S. SHERMAN).—Corn never looked better than now. Rowen is very good, better than we have had for many years. Potatoes turn out well; some rot, though not bad. Apples good, pears rather scarce, no peaches, grapes plenty and cranberries a good crop. Pasturage is in very good condition. Oats were never better, but the army worm destroyed many fields. There is not much done here with poultry. Milk is the principal product, paying the farmers better than anything else they can engage in.

Fairhaven (F. C. LYON).—Indian corn is in good condition, though there has been more injury from insects than usual. More rowen will be cut this year than in any former year. Potatoes have blighted early, are rotting, and the prospect is poor. Apples will be a fair crop, pears good, no peaches, grapes good. Pasturage is in good condition. Oats were a good crop. The proportion of the income derived from poultry to that derived from the dairy would be one-fourth.

PLYMOUTH COUNTY.

West Bridgewater (F. E. HOWARD).—Indian corn is in first-class condition. Rowen is in good condition and promises better than last year. Potatoes will be a smaller crop than last year; no blight or rot. Prospect for grapes and cranberries good; for pears and peaches very poor. Pasturage is in good condition. Oats and barley compare favorably with other years. Considerable attention is paid to poultry, and I should think the income derived from this source would be a third that derived from dairying.

Marshfield (J. H. BOURNE). — Indian corn is in excellent condition. Rowen promises to be more than an average crop. Potatoes are rather poor, though I have not noticed either blight or rot. Apples and cranberries both promise an extraordinary yield. Pasturage is now improving in condition. Oats and barley are good average crops. Plymouth County is largely engaged in poultry raising, and here the value of the poultry products far exceeds that of the dairy products.

Halifax (G. W. HAYWARD). — Indian corn never looked better. Rowen is growing finely. Potatoes have blighted somewhat, but I have heard of no rot as yet. There will be heavy crops of apples, cranberries and grapes. Pasturage is in very good condition. All oats and barley are mowed for fodder. Farmers in this vicinity receive more income from poultry than from the dairy.

Plympton (JACOB PARKER). — Indian corn is looking nicely and a good crop is promised. There is very little rowen raised this year. There has been some blight on potatoes and a little rot; the crop is not a good one this year. A large crop of fruit is promised, though the wind of last week took off much fruit. Pastures are looking finely. There are more people really engaged in the poultry business than in farming in this town, and most of them get a good income from it.

Kingston (J. H. CUSHMAN). — Corn is looking well, with the prospect of a heavy crop. Rowen is growing very fast and there will be a heavy crop. There have been but few late potatoes dug; no rot as yet. Apples, pears and grapes are plenty; no peaches; cranberries good. Pastures are very short. Oats and barley are about average crops. All our farmers keep from fifty to one hundred hens, and think they pay as well as the dairy.

Marion (J. B. BLANKINSHIP). — Indian corn is an average crop. Rowen promises to be a good crop. The prospect for potatoes is good, though I have noticed considerable rot. Apples a good crop, pears small, grapes and cranberries good. Pasturage is in good condition. There is considerable poultry kept, and the income is about equal to that derived from the dairy. Market gardening, poultry keeping and milk raising form the farming of this town.

BARNSTABLE COUNTY.

Barnstable (JOHN BURSLEY). — Corn is in good condition, except on fields injured by the root worm. There is no rowen, because the white grub has eaten the roots. Potatoes have been badly eaten by the white grub. Apples, pears and peaches very light; grapes and cranberries average. Pastures have also suffered from the ravages of the white grub. Oats and barley are nearly as good

crops as last year. Probably the poultry income is from two-thirds to three-fourths of the dairy income.

Chatham (E. Z. RYDER). — Corn is very good where there are no worms, but corn worms are quite plenty. Rowen is not up to the standard of former years. White grubs are eating potatoes and there is also some rot, so the crop will be below the average. Apples and pears are small crops, no peaches, grapes below the average. cranberries very good. Pasturage is in very fair condition. Oats promise very well, but barley is not as good as usual. Some few years back we were quite extensively engaged in poultry raising, but the business has steadily been on the decline, until now only small flocks are kept.

Orleans (JOHN KENRICK). — Corn has grown rapidly and is in first-class condition. Rowen is a full average crop. Potatoes have blighted considerably, but there is no rot as yet. Apples average, pears and peaches small, cranberries below the average, owing to fire worms and other causes. Pasturage is in very good condition. Oats are a very good crop. A great deal of attention is paid to poultry, and the income is fully equal to that from the dairy.

Eastham (J. A. CLARK). — Indian corn looks well. The prospect for rowen is good. There is some complaint of blight on potatoes. Apples a good crop, pears light, cranberries fair. Pasturage is in good condition. Oats and barley are average crops. A good deal of attention is paid to poultry. Should say the income derived from it was larger than that derived from the dairy.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER.) — Corn is looking well. Rowen does not promise as well as in previous years. Potatoes are about a two-thirds crop; some rot. Pasturage is in very good condition. Oats are better than last year, but they are mostly cut for fodder. Considerable attention is paid to poultry. Personally, I find that poultry pays better in proportion to cost than the dairy does.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Corn is in poor condition, being badly eaten by worms. Rowen will be a good crop where the white grub has not worked. Potatoes are a poor crop and both blight and rot have appeared. Apples promise to be a good crop. Pasturage is in very good condition. Oats are an average crop. Our farmers all keep a few fowls and some quite a number, and the income derived is about equal to that derived from the dairy.

BULLETIN OF MASSACHUSETTS BOARD OF AGRICULTURE.

THE CROW IN MASSACHUSETTS.

By E. H. FORBUSH, *Ornithologist to the Board.*

Birds of the crow family have had a peculiar interest for the farmer for many years, both in the old world and in the new. Unfortunately for the American crow (*Corvus americanus*), it has come to have a bad name among men. Therefore, crows are proscribed by law, every man's hand is against them; mercilessly hunted, they are perforce wanderers on the face of the earth.

However much the enemies of the crow may inveigh against it, they must admit that it is a creature of superior intelligence. Its grain-loving proclivities, together with its sagacity and cunning, make it a most annoying bird to the farmer. Considerable ingenuity is required to circumvent the crow. Yet it is not naturally a supremely cautious or suspicious bird. Primarily bold and fearless, it acquires caution by force of necessity. On the Pacific coast, especially during the first settlement of the country, crows were extremely bold and unsuspicious, and this is true to-day in localities remote from civilization. Mr. H. W. Henshaw, in the "Youths' Companion," speaks of the boldness of the crows of the Pacific coast in robbing hogs, the crows alighting on the head of the hog and plucking clams from its very mouth. The writer has been informed by old settlers of what was then Washington Territory that they have seen crows so tame and so eager in their search for food that they have even perched upon the backs of squaws engaged in digging clams, and attempted to snatch the clams from under the hands of the diggers. The writer has frequently seen the north-western crows (*Corvus caurinus*) so tame that, while engaged in searching for food, they would walk about on the sand within a few feet of the observer. Yet these same crows soon learn the significance of the sound of a gun, and the shooting of a few of their number by gunners will render the rest more wary. In the east crows have learned by association and experience to beware of the approach of man, and are considered as among the most difficult of all birds to approach. This wariness is only overcome

by the pangs of hunger. In winter, when the snow lies deep on the ground and food is scarce, crows will become quite fearless in their approach to carrion. As a rule, however, crows when feeding keep one or more sentinels posted on some high tree or other point of vantage, to warn all within hearing of the approach of any possible enemy, and the warning of the sentinel is understood and heeded by all the crows in the vicinity.

The intelligence of crows, like that of men, varies with individuals. Young birds, who when they first leave the nest are rather incautious, soon acquire the habits of caution taught them by experience and the warning cries of their elders.

All farmers know how difficult it is to entrap crows. Indeed, they are so suspicious of a trap that any contrivance which to their eyes resembles a trap will sometimes keep them away from corn.

MIGRATION.

The crow as a species is a resident in this Commonwealth throughout the entire year. It is, however, quite migratory in its habits. There are times of general migration towards the south in the fall and toward the north again in the spring. During the fall and winter migrations thousands of crows may be seen trooping south or in the direction of the sea-coasts and river valleys. It is probable that the crows that remain with us in winter are migrants from lands farther north. The crows appear to desert entirely some of the more northern and western portions of the State during the season of the greatest cold and snow. Mr. C. E. Bailey reports that in ordinary seasons crows leave the vicinity of Winchendon, Mass., which is near the New Hampshire line, but that they are often found further south in Hubbardston and Princeton.

Mr. A. H. Kirkland writes that, from observations covering five or six years, and from conversation with hunters, he has learned that during the coldest weather crows disappear from some of the high lands in the western part of the State. The cause of crow migrations appears to be principally a scarcity of food. Crows remain even in Winchendon in seasons when the beech nuts are plentiful on the trees or when carrion is to be found. They are also found along the Connecticut valley throughout the entire winter, where, according to Mr. Kirkland, they assemble in great flocks in bare spots on the meadows, and catch field mice. These flocks appear to range about twelve or fifteen miles from the river, and in warm spells spread out still farther. At Mr. Kirkland's home, in Huntington, at an altitude of twelve hundred feet, and in the adjacent towns of Chester, Blandford and Chesterfield, the crows are said to remain during mild winters, roosting in hemlock forests.

During severe weather they disappear entirely for a month or six weeks at a time. Near large cities, where offal or carrion may be found, they usually remain throughout the winter in large numbers. They are also found during the entire winter along the south-eastern sea-coast, where the receding tides furnish them an abundance of food, and where the ground is not so heavily and frequently covered with snow as in the interior.

GREGARIOUS HABITS.

Crows are very clannish in their habits, consorting together in flocks during the entire season, except while they are nesting, and assembling during the winter in roosting-places to pass the night.

Professor Barrows has given an excellent account of the roosting habits of crows in the middle and some of the western States.* Here permanent winter roosts are found, to which the crows come nightly for many miles around and from which they go out early each morning. It is estimated that several of these roosts contain from fifty thousand to three hundred thousand crows each. This gregarious roosting habit is observed also among the crows of Massachusetts, yet the writer has never seen in this Commonwealth such large permanent roosts as are described as existing in the middle, southern and western States. This may be explained by the fact that a large number of crows migrate south from the northern States and crowd into the middle and southern States, where, the winter being less severe, food is more plentiful.

The crow roosts visited by the writer in eastern and central Massachusetts were in evergreen trees, mainly in white pine woods, and there the crows were known to change their roosting places, moving from one locality to another and again returning to the original roost.

Just why the crows congregate in these winter roosts is hard to determine. It may be that they are in a measure protected, by their great numbers, from their enemies, yet they are doubtless sometimes attacked by the great horned owl in the night, as evidences of the destruction of crows by these owls are occasionally found in the snow about the roosts. Crows sometimes hold what bears the semblance of a funeral ceremony over their dead. In such a case, a crow having been shot flew some distance and fell dead upon the snow. Soon afterwards its body was discovered by another crow, whose cries immediately assembled others from all quarters of the compass, until a vast concourse was flying over-

* Bulletin No. 6, United States Department of Agriculture, Division of Ornithology and Mammalogy, "Common Crow of the United States," pages 11, 12.

head. They gradually settled upon the trees and kept up an intermittent outcry for some time. In another case a single crow appeared to be the leader, and it was long before the immense throng dispersed.

Crows have a habit of mobbing and hectoring any animal that they believe to be an enemy. In the fall or winter months they often gather in flocks and follow hawks or owls. The appearance of a great horned owl, hawk, raccoon or fox, either dead or alive, is the signal for the gathering of a mob of crows from all the country round, when they will pursue the luckless bird or animal, if it is alive, and continually annoy it even if they do not actually attack it. At such times, amid the noise and excitement, they lose some of their habitual caution and may be more readily approached than usual. They will sometimes press an owl very closely, keeping the poor bird dodging about from tree to tree in a ludicrous manner.

MATING AND NESTING HABITS.

Very early in the spring, when the snow is melting, the crows indicate by their actions the approach of the mating season. Their usually harsh notes are frequently varied by very musical tones, very different in quality from the harsh "caw" commonly heard. These notes are sometimes heard well into the nesting season. Indeed, the crow has a great variety of notes, and quite a language of its own. Those who have examined its vocal organs, which are very complicated and perfect, are not surprised that crows have even been taught to speak and whistle. On warm days, early in April, males may be seen pursuing females in swift and graceful aerial evolutions, sometimes rising high above the woods and again descending into the open spaces among the trees. Nests are soon begun, and, although they are composed largely of sticks, intermixed with coarse moss or even leaves, they are quite compact and not unhandsome structures. The lining is made of grape-vine bark, grass, moss, hair, squash vines, feathers, rootlets or similar materials. Portions of the skins of animals, such as snakes and hares, are often found in the lining. Mr. Bailey says he has seen a crow pull up pieces of squash vines some eight feet in length and carry them to the nest. The materials used in lining the nest vary with the locality. For instance, about Winchendon Mr. Bailey has never seen a nest lined with the bark of the grape, and he says there are few grape vines in the vicinity. In southern Worcester County the grape-vine bark is much used, while in eastern Massachusetts cedar bark takes its place.

The eggs are laid from the middle of April to July. In some cases what appears to be excessive caution is exhibited by the crow

in covering the eggs with leaves when away from the nest. The writer has in two instances found fresh eggs of the crow carefully covered with dead leaves, and in one case the birds appeared soon after the nest was reached. Mr. F. A. Bates mentions a similar instance. The eggs vary in number from three or four to seven, and in color from a light, unspotted green or greenish-blue to a darker hue, thickly covered with heavy brown and dusky spots. There is a great variation also in the size of the eggs. Probably only one brood is usually reared, but if the first nest is destroyed the crow will build another, and where this is repeated, young fledgling crows are sometimes seen early in August.

The situation of the nest varies according to locality. When the nests and eggs are destroyed by man the crow soon learns to nest high. The tree chosen is usually a large conifer, the white pine being a favorite. Where it is not molested it will sometimes nest within a few feet of the ground. Mr. Bailey mentions having found nests at the height of seven or eight feet from the ground, on hemlocks, close to the trunks of the trees.

The outcry raised by the mother crow when an enemy approaches the nest is usually answered by two other crows, and the writer has frequently seen three crows in the vicinity of the nest. So far as his observation goes, this seems to be the rule. Mr. F. H. Mosher says that in south-eastern Massachusetts, where his observations were made, he has always found three adult crows about each nest during both the building of the nest and the rearing of the young. He has frequently noticed this even when they were undisturbed. During the building of the nest one would carry most of the sticks and the others would follow back and forth with more sticks.

Mr. Bailey speaks of an instance where a pair of these birds which were raising young were shot, and another crow fed the young. The female was first shot on the edge of the nest; a few days later the male was shot at the same place. Seven days later the young were alive and flourishing, and a third crow was observed to feed them. These young birds were finally reared. There is usually an excess of male birds, and the presence of bachelor birds in the vicinity of the nests may be offered as an explanation of these facts, or polygamy may be possible. This is a phase of the crows' life history which it might be well for some one to investigate who can devote the necessary time to the subject.

The female is said to perform the duties of incubation, but the male bird is a gallant defender and a good provider, exhibiting qualities which are always commendable in the father of a family. As soon as the young are able to leave the nest, they are sustained,

watched, guarded, admonished and taught by both parents, and the family remains together as long as the young require any attention.

DIGESTIVE CAPACITY OF THE CROW.

To obtain a definite understanding of the amount of good or harm the crow is capable of doing, it is essential to know what amount of food it is obliged to consume in order to maintain its strength. Mr. E. A. Samuels says that he has kept specimens in captivity, and has, by actual observation, proved that at least eight ounces of animal food, such as frogs, fish, etc., are eaten daily by them.*

To determine how much food the fledged young require, the writer had two young crows confined in a large pen or cage. These crows were kept and fed until September 2, when one was accidentally killed. The other was kept until September 14. These crows were fed animal and vegetable food in about equal proportions, and the amount of each eaten by them was surprising. Either appeared to be eaten with nearly equal avidity, although at times a distinct preference was shown for animal food. The animal food consisted of the larger insects, such as grasshoppers, crickets, borers and beetles; also of snakes, frogs, mice and meat. The vegetable food consisted largely of tomatoes and green corn. It soon became evident that the crows were not being fed sufficiently, as they did not thrive.

From August 21 until their death the crows were each weighed daily, and the food given to them was also weighed. On September 2 they were each weighed, the larger weighing sixteen and one-half ounces and the smaller fifteen ounces. When fed less than eight ounces each they either did not increase in weight or fell off, and it was not until each crow was fed ten or more ounces that their weight increased. If the amount given the crows was largely reduced during any one day there was a corresponding falling off in the weight of the bird. On September 13 the larger crow weighed eighteen and one-half ounces. On that day it was given only two ounces of tomato, fifty-six grasshoppers, twelve crickets and a little grain, in all some three ounces of food. The next morning it had lost one and one-half ounces in weight.

As a preliminary to the solution of some of the problems which come up during stomach examinations, a knowledge of the processes of digestion and their possibilities in the species under consideration is indispensable.

* E. A. Samuels, "Birds of New England," page 359.

To determine the length of time required for digestion, two methods were used: first, feeding substances more or less indestructible, such as the eggs of the gypsy moth (*Porthetria dispar*), and afterwards examining the excreta, to determine how soon the eggs were dropped; second, an examination of the stomachs of the dead birds. Ten experiments of the first class and two of the second were made upon the two birds.

From the time of the beginning of the feeding period to the time when the first eggs were dropped in the excreta averaged one hour, twenty-nine minutes and forty-five seconds, or approximately one and one-half hours. The minimum time was forty-eight minutes and the maximum time was an hour and fifty-four minutes.

When we consider that the indigestible substances are usually retained in the stomach much longer than those which are more readily digested, it will be seen that the digestion of the bird is remarkably rapid. The crow which was accidentally killed had fed freely upon grasshoppers for twenty minutes, and was killed ten minutes after the close of the feeding period. An examination of the alimentary canal showed the stomach to be quite full, but less than fifty per cent of the contents were in a condition to be recognized. These were more particularly the hard parts of the wings, thoraces and legs. The strongly chitinized pronota and hind femora of the grasshoppers offered the most resistance to the digestive process. The other fifty per cent of the stomach contents was so finely divided that one would hardly care to express a positive opinion as to its identity.

The second crow was killed thirty minutes after the close of the feeding period, which lasted four minutes, in which time the bird ate six crickets and eleven grasshoppers. Twenty-five per cent of the stomach contents was unrecognizable.

Mr. Kirkland, who made the examinations, says: "I think from what we have seen that we would expect to find the stomach emptied in about one to one and one-half hours."

The softer or more liquid food must evidently be digested in a very few minutes and rapidly assimilated.

THE FOOD OF THE CROW.

The investigation of the food of the crow, which was begun in 1885 by the direction of the ornithologist of the Department of Agriculture, is by far the most important examination of this bird's food ever undertaken. A preliminary statement of the results of an examination of ninety-eight stomachs (eighty-six of the common crow and twelve of the fish crow) was published in the annual report of the Department of Agriculture for 1888.

In summing up the evidence obtained from all sources Professor Barrows says: "The careful examination of large numbers of stomachs and the critical study of the insect food of the crow may change materially the present aspect of the question; but, so far as the facts at present known enable a judgment to be formed, the harm which crows do appears to far outweigh the good."*

A final report on the crow's food is embodied in a pamphlet issued by the department in 1895, entitled "The Common Crow of the United States." This report is based upon the examinations of the contents of nine hundred and nine crows' stomachs, and much information gathered from correspondents.

Most of the material except the insects found in the stomachs was examined by Prof. F. E. L. Beal, assistant ornithologist, and important assistance was also rendered by Dr. A. K. Fisher. The insect material was examined and reported on by Mr. E. A. Schwarz. Professor Beal received valuable assistance from Dr. George Vasey, Mr. F. V. Coville and Mr. F. A. Lucas. The names of all these eminent specialists form a sufficient guaranty of the accuracy of the work done.

In summing up the notes for and against the crow, Dr. Merriam, chief of the Division of Ornithology and Mammalogy, says in his letter of transmittal: "The most important charges brought against the crow are: (1) that it pulls sprouted corn; (2) that it injures corn in the milk; (3) that it destroys cultivated fruit; and (4) that it feeds on the eggs and young of poultry and wild birds. All of these charges are sustained by the stomach examinations, so far as the simple fact that crows feed upon the substances named." But Dr. Merriam maintains that the stomach contents showed plainly that a large proportion of the corn eaten is chiefly waste corn; also that the loss in case of cultivated fruits is trivial, and that the same is true in regard to the eggs and young of poultry and wild birds. He also says that, as an offset to the bad habits of the crow, it should be credited with the good done in destroying noxious insects and other injurious animals. In summing up the benefits and losses from the crow, Dr. Merriam says: "It is clear that the good exceeds the bad, and that the crow is a friend rather than an enemy to the farmer."

In Massachusetts the chief complaints by farmers in regard to the crow relate to its destruction of corn. It must be admitted that the crow destroys considerable quantities of corn soon after it is planted, either by picking or digging up the corn or by pulling up the young shoots to get at the kernel. We have heard some

* Annual Report United States Department of Agriculture, Report of the Ornithologist and Mammalogist for the year 1888, page 525.

complaint also in regard to the destruction of corn in the ear. It must not be inferred, however, that when crows are at work in the corn field they are always eating corn. On the other hand, crows have been shot in Massachusetts corn fields apparently engaged in pulling corn, whose stomachs, when examined, showed no trace of grain, but were largely filled with the white grub of the May beetle (*Lechnosterna fusca*), and various cut worms.

Crows are undoubtedly somewhat destructive to fruit, as they have been observed to eat apples, wild grapes and both wild and cultivated cherries.

Farmers when engaged in planting have occasionally observed crows digging up sections of potatoes and carrying them away from the hill. Mr. Mosher reports having seen crows in the fall in the act of carrying off such potatoes as were not entirely covered by the soil. Several reports have also been received of the destruction of the eggs and young of poultry by crows, and in these cases the observers actually saw the crows in the act. It would appear, from all the evidence obtainable, that in this region much harm may be done by the crows by the destruction of wild birds and their eggs. Some crows appear to be inveterate nest robbers. In Florida, in New England and on the Pacific coast the writer has observed that, where herons or sea fowl breed in large numbers, the crows congregate for the purpose of robbing their nests. In the "rookeries" of several species of Florida herons, in those of the night herons of New England and in breeding places of gulls and guillemots on the Pacific coast, crows appear to be always on the watch, and whenever either herons or sea birds leave their nests the crows hasten at once to feed on the unprotected eggs. Piercing them with their bills, they quickly eat or suck out the contents. This trait of the crow is well known to all observing ornithologists, and it is probable that most species of birds whose nests the crow can readily find and reach suffer at one time or another from such depredations. Although the writer has never seen the crow actually taking young birds from the nest, he has been told by many trustworthy observers that they have frequently seen the crows in the act. Those of the smaller birds whose nests are largest and most exposed, such as the robin, the red-winged blackbird and some of the thrushes, probably suffer most. Mr. Mosher says that he has seen the nests of smaller species, such as the chipping sparrow and red-eyed vireo, robbed by the crow. Those birds whose nests are most conspicuous suffer most frequently from its attacks. A vireo's nest which was placed within thirty yards of a crow's nest but carefully concealed under the leaves was overlooked by the crows. A nest of the ruffed

grouse was left unmolested, although it was within a hundred yards of a crow's nest. Mr. Bailey speaks of another which was placed immediately beneath a tree that contained a nest in which a pair of crows reared their young, the grouse rearing her young unmolested, meanwhile.

In the preliminary report on the food of crows, published in 1888, and based on the results of dissections of only eighty-six stomachs and information received from upwards of five hundred persons, Dr. Barrows writes as follows in regard to the destruction of the eggs and young of wild birds by the crow : —

“No observant person will deny that the crow does serious damage to the eggs and young of wild birds. The instances of such depredation which have come within the knowledge of most farmers or other persons living in the country are far too numerous to leave a shadow of doubt on this score in any unprejudiced mind.

“Yet, for every instance of such robbery witnessed by man, thousands must take place without his knowledge. Persecution by crows is doubtless a very large factor among the influences which cause so many birds to crowd about human habitations during the nesting season; and yet the relentless crow follows them even to the eaves and window-sills of houses, taking their eggs and young in spite of every precaution.

“The evidence on this point, contributed by our observers during the past few years, is replete with accounts of such forays, and the only wonder is that robins, thrushes, blackbirds and many other species continue to rear any young at all.”*

In the later report, published in 1895 and based mainly on the examinations of a much larger number of stomachs, Professor Barrows seems inclined to minimize the harm done by crows in this manner, and Dr. Merriam regards it as trivial.

Professor Barrows states in the later report that it seems probable that not more than one crow in twenty becomes addicted to this sort of stealing.† While this may be true, the avidity with which crows so often attack birds' eggs and young and their eagerness to be on the scene as soon as possible whenever an opportunity for eating eggs is presented would lead one to believe that it is more probable that most crows are addicted to such stealing whenever eggs can be readily found. Numbers of sea birds breed on a small, treeless island in the San Juan Archipelago, Puget Sound. Immediately upon their being disturbed or driven off by white men or by the Indians, crows flock from the islands in the

* Annual Report United States Department of Agriculture, Report of the Ornithologist and Mammalogist for the year 1888, page 513.

† “The Common Crow of the United States,” page 47.

vicinity to feed upon the eggs or young of the sea fowl. The writer found on this island a nest of the north-western crow, which was built in a hollow dug in the earth at the top of the rock and protected by a few scattered grasses and cacti. This nest contained three young crows and was guarded closely by the parents. The only reasonable explanation of the breeding of the crows upon the earth upon the top of this barren, rocky island seemed to be that their favorite food, the sea birds' eggs, was more accessible to them here than elsewhere. Being located on the island, they were enabled to reach the nests of the sea birds far in advance of other crows, which must come from other islands situated a mile or more away. On these other islands there was a great forest growth; vegetation was far more plentiful, there were bars bare at low tide, and there was in every way a better opportunity for nesting and for securing animal food, with the exception of the sea birds' eggs, than on the rock where the crows bred. Stomach examinations cannot safely be relied upon entirely to determine the amount of eggs or young birds eaten by the crow. The rapidity with which such substances as the contents of eggs are digested by the crow suggests the probability that egg contents cannot often be recognized in the birds' stomachs. Indeed, Professor Barrows reports that the remains of eggs found in the stomachs of young birds consisted only of pieces of shell.* As the crow usually makes but one hole in the shell and sucks or eats out the contents, it is not likely to swallow much of the shell, and such small portions of the shells of the eggs of small birds as are swallowed soon become so finely disintegrated in the stomach as to be unrecognizable. The softer parts of nestling birds would soon disappear from the stomach, and the bones, being soft, are digested.

According to the stomach examinations made, that portion of the food consisting of the eggs and young of wild birds forms hardly one per cent of the food of the crow for the year. Now, if we assume that the crow eats only five ounces per day, or one-half the amount required by our young birds, one per cent of the food of the crow for the year would amount to eighteen and one-fourth ounces. Assuming that the young birds or eggs eaten by the crow average one ounce each in weight, which is perhaps a high average, we have eighteen and one-fourth birds or eggs to each crow as its record for the season. If we allow only ten families of crows of five each for one of our larger western townships, the fifty crows would destroy over nine hundred young birds or eggs. Whether such destruction should be regarded as "trivial,"

* "The Common Crow of the United States," page 47.

seems, in the present state of our knowledge on the subject, largely a matter of opinion. When we consider, for reasons previously given, that in all probability the stomachs examined did not give a full record of the devastation committed in this manner by the crow, it seems possible that the bird may deserve the bad name it has been given as a destroyer of the young and eggs of other birds. But it is difficult, if not impossible, to determine, at least by stomach examinations of the crow, whether the birds that are destroyed or those resulting from the eggs even would have been of sufficient economic value, if allowed to live, to more than offset the balance in favor of the crow for services rendered by destroying insects and injurious mammals.

It is evident, from the excellent report made by Mr. E. A. Schwarz on the examination of the insect food contained in the crows' stomachs obtained by the Department of Agriculture, that the crow would be a great blessing to the farmer during the spring, summer and early fall, were its diet confined to insects.* Its services in destroying grasshoppers and May beetles and their progeny, the destructive white grub, are not generally appreciated. Add to them the destruction of cut worms, click beetles and weevils and other destructive insects, and the farmer is well able to spare such of his insect friends as the crow destroys, *i. e.*, the ground beetles and soldier bugs. We must, therefore, agree with Mr. Schwarz that "the facts, on the whole, speak overwhelmingly in favor of the crow, and, taken alone, would be at variance with the prevalent opinion hitherto held and yet held regarding the economic status of the crow as an insectivorous bird." Mr. Schwarz makes some rather sweeping generalizations, however, based on the results of the examinations of stomach contents, which do not agree with recorded observations carefully made in eastern Massachusetts. He says: "The insect food of crows is almost exclusively composed of terrestrial species, *i. e.*, such as are found on the surface of the ground or hide during the daytime at the base of plants or under the various objects lying on the surface; or such as live in the dung of domestic animals, in decaying vegetable and animal matter or underground." And again: "The almost complete absence of the numerous arboreal insects of all orders, *i. e.*, such insects as are to be found on or which live on the trunks, limbs or leaves of trees and shrubs, indicates that the birds when sitting or resting on trees do not pick up insects."

To those who have observed crows feeding in summer in orchards or forest trees for considerable periods on some of the larger cater-

* "The Common Crow of the United States," pages 56, 67.

pillars these seem rather remarkable statements. To such observers the almost complete absence of such food from the stomachs examined would merely justify the conclusion that most of the crows were shot while, or soon after, feeding in fields, gardens, pastures, prairies or other open land. It seems most astonishing that the examination of so many stomachs should yield the remains of so few arboreal insects. While all who have closely observed crows must agree that much of their feeding is done on or near the ground, yet it must be admitted that in the more wooded districts of Massachusetts, at least, in the late spring and during a part of the summer the crows feed much in and among trees in which insect food is plentiful, and that, although they may destroy some fruit in the orchards, such as cherries and apples, the chief sustenance they obtain in summer from the trees consists of insects.

The past two seasons, 1894 and 1895, have been "canker-worm years" in eastern Massachusetts, and the two species of canker worms, *Anisopteryx vernata* and *Anisopteryx pometaria*, have been very abundant not only in the orchards but among the elms, both in the parks and woods. Those who have watched the smaller warblers and sparrows feeding on these caterpillars are aware that many of them escape the birds by spinning down from the twigs as they are disturbed by the movements of their pursuers. The crow, however, takes advantage of this habit of the worms. Its keen eye marks the brown and almost leafless branches of the orchard, and, as with slanting flight and sudden swing up wind the sable bird flaps heavily down upon a bough, the canker worms, startled by the sudden shock, spin down from the branches and twigs in dozens, and the crow, moving clumsily, if you will, from branch to branch, and stretching its neck after the manner of a hen engaged in a similar occupation, quickly gathers the suspended canker worms into its rapacious maw. Gentry refers to *Anisopteryx vernata* as one of the species sought by the crows to feed their young.* Not only does the crow destroy the smooth-skinned larvæ, such as *noctuids* and *geometrids*, but it seeks out such hairy larvæ as those of the tent caterpillar moth *Clisiocampa americana*. These the crow can readily secure in large numbers by tearing open their nests when the caterpillars are gathered within. Crows have been seen to visit these nests and empty them of their contents. This habit has been recorded elsewhere.†

In the investigations of the natural enemies of the gypsy moth, undertaken by the Massachusetts State Board of Agriculture, the

* "Birds of Eastern Pennsylvania," 1877, vol. II, page 5.

† See Massachusetts Crop Report, July, 1895, "Birds as Protectors of Orchards."

crow has been found one of the most useful birds. It destroys not only the caterpillars but also the pupæ in large numbers.* These observations, made in 1895, have since been supplemented by more complete and convincing investigations made during the present year. Wherever the caterpillars of the gypsy moth appear in such numbers in the woods as to strip the trees of their foliage to a noticeable degree, crows seem to be attracted from the neighboring woods by the abundance of insect food, and they frequently have been seen to lead their fledged young to such localities. These families of crows may often be found in the early morning feeding upon the larvæ and pupæ of the gypsy moth. Like the jays, shrikes and titmice, they destroy many insects which they do not eat, although they eat greedily. In such cases it will be noted that stomach examinations would not show the full value of the birds as caterpillar eaters.

In view of the well-known difficulty encountered in approaching crows, some doubt may be expressed as to the accuracy of these observations. This work has been so carefully done, however, that there can be no possibility of mistake. The caterpillars and pupæ of the moth are quite large and conspicuous, and the birds have been observed at such close range that in some cases the number of insects they ate might be readily counted. Mr. Bailey carefully concealed himself early one morning in a swamp in Malden, Mass., for the purpose of watching birds that fed on the caterpillars and other forms of the gypsy moth which swarmed on the near-by trees. No crows came at first, but soon two adults and their four young appeared, and most of them remained feeding on the moths for nearly an hour, and until an incautious movement of the observer startled them, when they left and did not return while he was there. The caterpillars have the habit of clustering in sheltered situations on the trunks of trees and under sides of branches during the day. A crow would approach one of these clusters and eat some of the caterpillars and pupæ, pecking and killing many more than it ate, dropping their mutilated forms on the ground. The crows all seemed to prefer the pupæ to the caterpillars, possibly on account of the disagreeable character of the larval hairs. For a portion of the time the crows were picking up pupæ as rapidly as a domestic fowl picks up corn. One of the young crows while engaged in feeding came within ten feet of the observer. Their feeding could be readily seen, as the caterpillars had stripped nearly all the leaves from the trees. They moved through the trees about and above the observer during most

* Report of the State Board of Agriculture on "The Gypsy Moth," 1896, page 217.

of the time, although the old birds flew away for a time, returning later. The young birds appeared to attack the caterpillars and chrysalids more eagerly than did their parents.

The crows not only search the crevices of the trunks of the trees but pry about beneath the limbs, showing that they quite readily adapt themselves to feeding in the trees. Not only do crows frequent the more open places where the caterpillars have stripped the trees, but they are frequently seen feeding in woods in localities where larvæ are not so plentiful, and undoubtedly pick up many species during the season when the various caterpillars are found upon the trees. On one occasion Mr. Mosher saw a crow search out and eat four forest tent caterpillars (*Clisiocampa sylvatica*), after which it moved from tree to tree apparently engaged in the same occupation.

If the habits of the crow in Massachusetts are not exceptional, then it must be admitted that the crow obtains much insect food from trees during a portion of the summer. This habit of caterpillar eating must be set down to the credit of the crow in this region, and is certainly one strong point in its favor.

THE PROTECTION OF CROPS

It would seem that in Massachusetts greater injury is done by the crow to the corn crop than to any other, and it has been a time-honored custom to place effigies supposed to represent the human figure, or dangling strings, dead crows or other "scarecrows" in corn fields. Though these artifices often keep crows away from corn, they do not always succeed in accomplishing the object, and their use is not to be generally recommended, even if successful, for by driving the crows away from corn fields the farmer loses their services as a destroyer of noxious insects. Fields of corn located at a distance from farm buildings and those near woods in which the crow nests are likely to suffer most if unprotected. If the crows can be prevented from attacking the corn when first planted or when it first appears above the surface, there seems little danger, in Massachusetts, that they will feed on the corn at all. For many years farmers have been in the habit of soaking their seed corn, to cause it to germinate quickly, and then smearing it with tar. The taste of tar is known to be repugnant to crows and blackbirds, and will prevent them from pulling the corn, for when they have pulled a few stalks they apparently conclude that all the corn is tainted in the same way, and will take no more from that field. The receipt commonly used is to place a half bushel or more of soaked corn in a vessel and enough coal or gas tar to give each kernel a thin coat, when the mass is stirred with a

stick. After this plaster of Paris or wood ashes are stirred in until the corn is well coated with it. When this is done, however, the planter cannot be used, and the corn must be planted by hand. For this reason many prefer to feed the crows with soaked corn during the time when the newly planted corn is subject to their attack. When this plan is followed the corn may be planted with the planter and a little soaked corn scattered daily around the borders of the field. This plan is said to give good satisfaction. In this way a few quarts of corn have been found sufficient to prevent the depredations of the crow in a corn field of eight or ten acres.

If the common king birds (*Tyrannus tyrannus*) are not driven away from the farm or field, because of their real or supposed depredations among the bees, they will keep the crow away from the vicinity of the farm buildings and fruit orchard, where, if the smaller birds are encouraged to nest, the services of the crow will not be usually needed during the nesting season. The king birds protect not only their own eggs and young but those of wild birds and poultry.

Crows may be readily poisoned by soaking corn in strychnine, and after a few have been poisoned in this way the others usually forsake the field. But such uses of poison are prohibited by law, and the destruction of the crow or its exile from the field are not usually to be desired. Scarecrows of various kinds may be used when corn is in the milk, to keep crows from the fields.

IS THE CROW A FRIEND?

The question, Is the crow a friend or an enemy to the Massachusetts farmer? can only be answered by an exact knowledge of what constitutes its food at all hours of the day, at all seasons of the year and under changing conditions. This must be supplemented by an exact knowledge of the economic value of the plants and animals on which it feeds. Therefore, to answer this question by a scientific investigation with even approximate accuracy would be the work of years. The crow, unlike many other birds, is almost omnivorous, feeding on anything, living or dead, which it can utilize as food. A species which can adapt itself to all kinds of food is likely to remain a stable factor in any *fauna*, as it is far better able to maintain its normal numbers without great fluctuations than a bird which is by nature obliged to depend on a more limited diet. The omnivorous species, always finding sustenance, either vegetable or animal, are enabled to maintain their numbers, forming a standing army always at hand to attack any great outbreak of injurious mammals, reptiles or insects, or even to clear the land of carrion.

If our experiments are conclusive, young crows require more than half their own weight of mixed animal and vegetable food daily. If in computing the amount of food eaten by adult crows we assume that they can live on half this amount, or only five ounces of food per day, it is plain that one thousand birds would consume three hundred and twelve pounds daily. If their food on any one day consisted almost entirely of field mice, injurious insects, wild berries and seeds, they would be, on that day, very beneficial to the farmer. If, on the other hand, their food on a certain day consisted of toads, the young or eggs of poultry and wild birds, corn or other grains and cultivated fruit, they would be, on that day, very injurious to the farmer. The question as to whether the crow is beneficial or injurious depends entirely on how the account balances at the end of the year.

The crow cannot fail to be very valuable to agriculture if its food habits are on the average more beneficial than injurious. If, however, the balance is upon the other side, the bird may become a serious pest. If in times of plenty its numbers increase beyond all reasonable bounds it is likely to grow injurious in proportion to its numbers. When crows become so plentiful in any locality that they cannot find a sufficiency of animal food for their young they are likely to turn their attention to poultry and wild birds, and also to do more injury to farmers' crops.

In summing up the evidence for and against the crow, it must be admitted: first, that the crows injure the corn crop to some extent, and some other crops slightly; second, they are somewhat destructive to the eggs and young of poultry and wild birds; third, they distribute the seeds of poisonous plants; fourth, they destroy some beneficial insects, probably killing more than they eat; fifth, they eat large numbers of frogs and toads. On the other hand: (1) the services of the crow in destroying noxious insects can hardly be overestimated; (2) crows are of great service in destroying field mice and other small mammals; (3) crows are useful to some extent as scavengers.

While it may be impossible with the data at hand to determine the exact economic status of the crow in Massachusetts, the question asked at the beginning may be answered in a general way. The wholesale destruction of crows is said to have been followed by a remarkable increase of injurious insects, and from what is now known about the crow's food we may conclude that, unless the birds become unduly numerous, they are likely to be of great service to the farmer. It will pay the farmer to sacrifice some portion of his products to the crow, provided he uses care that the cunning bird does not overreach him in the bargain.

SERIES OF 1896.

BULLETIN No. 5.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF SEPTEMBER, 1896.

ISSUED BY

WM. R. SESSIONS,
SECRETARY STATE BOARD OF AGRICULTURE

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CROP REPORT FOR THE MONTH OF SEPTEMBER, 1896.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Oct. 1, 1896.

Bulletin No. 5, Crop Report for the month of September, is herewith presented. Particular attention is called to the article on "The Babcock Milk Tester," by Geo. M. Whitaker, assistant executive officer of the State Dairy Bureau.

PROGRESS OF THE SEASON.

Report No. 141, New Series (September, 1896), of the Statistician of the United States Department of Agriculture, shows a decline in the condition of corn of 5 points from the August statement, or from 96 to 91. In spite of this falling off in condition the crop promises to be a large one, as nearly all the great central States report a high condition.

The general condition of wheat, considering both winter and spring varieties, when harvested, was 74.6, against 75.4 last year. East of the Rocky Mountains complaints of both quantity and quality of the crop are almost universal, the causes given being winter-killing, stunted growth, insects' attacks, rust and heavy rains following harvesting. The Pacific slope suffered somewhat, but not so generally as the central and eastern States.

The average condition of barley for the United States is 83.1, substantially the same as in August, when it was 82.9. In 1895 the September condition was 87.6 and in 1894 it was 71.5.

The average condition of rye at time of harvest was 82 per cent, in 1895, 83.7, and in 1894, 86.9. In Michigan the crop suffered much from rust and insects, and in Kansas a condition of 60 was made, largely by dry, hot weather.

When harvested oats had the condition of 74 per cent, 12 points below 1895 and 3.8 below 1894. The condition has fallen 3.3 points since August 1. Reports from most of the important States are that oats are largely a failure as a money crop. Rains appear to have been the chief cause of damage, supplemented by heavy winds, rust and army worms.

The average condition of buckwheat is 93.2, as against 87.5 last year and 69.2 in 1894. Drought, grasshoppers, rain, winds and heat brought down the condition 2.8 points during the month.

The average condition of Irish potatoes is 83.2, against 94.8 August 1, a decline of 11.6 points. All but ten States show a decline. Drought, affecting chiefly the late crop, is given as the cause in certain localities, but generally the crop has suffered from excessive rains, which aggravated a tendency to rot. Blight and rust, with potato bugs and other insects, have also operated against the crop. The condition is 7.6 points lower than last year, and, with the decreased acreage, will tend to keep the crop much below the phenomenal one of 1895.

The figures for sweet potatoes show a material decline in most States, including those where the crop is most largely grown, but as most of the crop was dug before this decline commenced the loss will not be as great as might be supposed. Drought is the chief cause of the decline.

The average condition of tobacco is 81.5, a fall of 5 points since August 1. The greatest fall in condition was in Maryland, 41 points, while a number of States show a considerable advance in condition. The average is 1.1 points below that of last year but is 7 points higher than that of 1894. Drought and excessive heat are the principal causes of decline, while the tobacco worm has done considerable damage in parts of Kentucky and Tennessee.

The area under clover seed is set at 93.2, that of last year, which was only 68 per cent of the area of 1894. The average condition is 78.7, against 64.4 a year ago, which indicates that there will be more marketable seed than last year in spite of the decreased area. Drought and excessive heat have worked some injury but more is reported from excessive moisture and the consequent growth of weeds.

The sorghum crop is generally in fine condition, if exception be made of certain of the Southern States, Colorado and California.

Sugar cane suffered a heavy decline in condition during the month. Louisiana, which produces the bulk of the sugar-cane crop, has now a condition of 54 only. In Texas the prospect is even poorer, and in all the Gulf States the condition is low.

The condition of apples has been generally maintained during the month, and the statements made in August as to crop prospects still hold good.

The average condition of peaches has declined to 42.8. The quality of the crop has not been up to the average, excepting some fruit from the mountain orchards. The curculio has proved particularly numerous this year. The condition of the California crop is lower than for many years.

The condition of the grape crop is generally good. In important districts in the east the figures are about where they were last year, but on the Pacific coast the crop is very much below the average, and nearly 20 points below last year.

Conditions for rice stood at 76.5 September 1, as against 94.5 in 1895 and 89.4 in 1894. The Louisiana crop is reported to be considerably below the average.

Cotton shows a decline from the August condition of 15.9 points, or from 80.1 to 64.2 per cent, the lowest September condition reported for twenty-seven years. The staple is much lighter than usual in consequence of drought and heat, and the shedding of leaves and bolls will result in material damage to the yield from the top crop.

There is a decrease of 7 per cent from last year in the number of stock hogs for fattening. Notwithstanding the numerous losses from disease and scarcity of feed in some sections of the country, the average condition as to weight and size is 0.6 point higher than that of last year, being 94.5, against 93.9 a year ago. Eight States show a condition above the normal.

In Massachusetts the average condition of corn September 1 is given as 100; the average condition of rye when harvested as 97; the average condition of oats when har-

vested as 100 ; the average condition of barley when harvested as 100 ; the average condition of buckwheat September 1 as 96 ; the average condition of potatoes as 81 ; the average condition of apples as 101 ; the average condition of peaches as 45 ; the average condition of grapes as 90 ; the number of stock hogs fattening as compared with last year as 96 ; the average condition of stock hogs as to weight and size as 100 ; and the average condition of tobacco as 113.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

FROM UNITED STATES WEATHER-CROP BULLETINS.

Week ending August 31. — Week cooler than usual in the Lake region, the Ohio, Mississippi and lower Missouri valleys, and generally throughout the Atlantic coast States. Week also slightly cooler than usual in central and portions of southern California. Along the Gulf coast, over the southern Rocky Mountains and middle plateau regions and on the north Pacific coast the temperature was generally slightly above the normal. It was also warmer than usual over the central Rocky Mountain slope and over the northern plateau region. The week was dryer than usual in all districts east of the Rocky Mountains, with the exception of portions of the south Atlantic and east Gulf States, and local areas of limited extent elsewhere. In the lower Ohio, central and upper Mississippi valleys and over much of the Lake region, the Middle Atlantic States and the Missouri valley there was no appreciable rainfall. On the south Atlantic coast the rainfall was very heavy, and it was generally heavier than usual on the Pacific coast. The week has been very favorable for farm work, especially thrashing, and ploughing for fall seeding has progressed favorably. Cotton picking has made rapid progress. Much corn has been cut and the late crop is generally maturing rapidly. In Tennessee, Indiana and Pennsylvania the bulk of the tobacco crop has been housed and cutting is progressing rapidly farther north.

Week ending September 7. — The week was cooler than usual over the northern districts, from the Missouri valley eastward to the Middle Atlantic and New England coasts. It was also slightly cooler than usual along the immediate

east Gulf and central California coasts. In the Southern States, throughout the Rocky Mountain regions and on the north Pacific coast the week averaged warmer than usual. While more than the usual amount of rain fell in New England, over portions of the Lake region, middle Atlantic States, limited areas of the central valleys and on the Gulf coast, the week was dryer than usual over the greater part of the country. In the central valleys there was a general deficiency, but good showers, giving a slight excess over limited areas, were quite general. Eastern Montana, northern Wyoming, western South Dakota and limited areas in Minnesota, Iowa and Colorado received more than the usual amount of rain, while no appreciable amount fell on the Pacific coast. The week has been very favorable for general farm work and maturing crops. Corn cutting has progressed favorably and the late crop is mostly safe. In the principal corn States an excellent corn crop is now practically assured. Cotton picking has progressed rapidly under favorable conditions, and is now well advanced. Most of the tobacco crop has been cut and housed. Ploughing for fall seeding and winter-wheat seeding have both made good progress.

Week ending September 14. — The week was warmer than usual throughout the Southern States and over the northern districts from the upper Mississippi valley eastward, with the exception of a few stations along the Atlantic coast. In the lower Ohio, lower Missouri and central Mississippi valleys the week was decidedly warmer than usual. From the upper Mississippi westward to the Pacific coast, including the middle Rocky Mountain and plateau districts and the greater part of California, the week was cooler than usual. Over the eastern portions of Oregon and Washington, Montana and the western portions of the Dakotas the week was exceptionally cool. More than the usual amount of rain fell during the week over the States of the northern and middle Rocky Mountain slopes, and from the central Missouri valley eastward over Iowa, northern Illinois, southern Wisconsin and south-western Michigan. Very heavy rains also occurred on the southern New England coast, and over the central portion of the Florida peninsula. In the lower Lake region, Ohio valley, middle Atlantic States and generally through-

out the Southern States the week was dryer than usual. The general absence of rain has been very favorable for cotton picking, which has made rapid progress. Corn cutting has progressed favorably, and husking and cribbing are in progress. In the central States the week has been especially favorable for ploughing and seeding grain. Tobacco is about all housed, and the past week has been very favorable for curing.

Week ending September 21. — In the Southern States and on the middle Atlantic and New England coasts the week ending September 21 was warmer than usual. It was also slightly warmer over the southern Plateau region and over portions of the north Pacific coast. Over the greater portion of California, and throughout all northern districts from Oregon eastward to the lower Lake region, the week was cooler than usual. More than the usual amount of rain fell in the States of the middle and southern Rocky Mountain slopes, and from the lower Missouri valley eastward over the northern States to the New England and middle Atlantic coasts. Generally throughout the Southern States the rainfall was below the average. As most crops had been secured the heavy frosts over the Northern States during the latter part of the week caused little damage. The heavy rains lowered the grade of cotton but benefited the top crop. The general condition of the soil for ploughing and seeding of winter grain is excellent except in the Southern States.

SPECIAL TELEGRAPHIC REPORTS.

WEATHER BUREAU, BOSTON.

Week ending August 31. — New England. Boston: Cool, with light frost on some low lands, but no damage; heavy rain in extreme north, elsewhere dry, and rain needed in central districts; much sunshine; favorable ripening and harvesting weather; corn heavy; potatoes variable; apples large crop; fall seeding progressing.

Week ending September 7. — New England. Boston: Cool, with light frosts, causing some damage to sweet corn and vines; heavy rains across central districts thoroughly filling the ground and doing some damage by washing in

southern Maine; tobacco practically gathered and curing well; corn being cut; cranberry picking under way, fair crop.

Week ending September 14. — New England. Boston: Heavy rains in south-east and local interior sections; wind did some damage to corn and fruit in south-east; cranberries rotting some; tobacco curing well, so far; grass fields, pastures, late forage crops, newly seeded grass, and winter grains in excellent condition.

Week ending September 21. — New England. Boston: Heavy rains and local storms; some damage by hail and high wind; harvesting delayed; much corn cut and curing well; late potatoes rotting; some fruit continues excellent; pastures good and fine grass bottom for next year's hay crop.

MASSACHUSETTS WEATHER FOR SEPTEMBER, 1896.

At Boston the mean daily temperature was very nearly the normal, but the precipitation was 3.49 inches above the usual rainfall for the month. The highest temperature was 90°, on the 11th, and the lowest 40°, on the 24th. Light frosts have occurred on several dates in valleys and on level plains throughout the State, but there has been no general killing frost and most crops have been harvested free from its damaging effects.

Rain has been frequent and excessive in all districts. Crops have ripened pretty well, but the weather has been unfavorable for curing corn and grain and for harvesting the second crop. The ground is well filled with water at the end of the month, and wells and springs are filling up fast. The weather has been exceptionally favorable for the growth of late forage crops, and for pastures and newly seeded fields. Stock will come to the barns in unusually good condition from most pastures. Grass on old fields has thickened up and looks better than it has for some time. The conditions have been unfavorable for potatoes, and rust and decay have been increased over most of the State. Fruit has hung on fairly well.

Local rain and thunder storms have been as frequent and damaging as during any month this season. They were especially severe on the 5th–6th, 9th–10th and 19th.

Tobacco was secured remarkably free from damage by the weather and is reported to be curing well.

In the circular to correspondents returnable September 25 the following questions were asked : —

1. How does the crop of Indian corn compare with an average crop?
2. Are rowen and fall feed up to the usual average?
3. Has the average amount of fall seeding been done, and what is its present condition?
4. How does the onion crop compare with an average crop?
5. Are potatoes an average crop in yield and quality?
6. What is the prospect for root crops, celery and other late market-garden crops?
7. How have the apple, pear, peach, grape and cranberry crops turned out?

Returns have been received from 144 correspondents, and from them the following summary has been made up : —

INDIAN CORN.

Indian corn is now practically all cut and stooked, and husking has commenced in many localities. The promise of the earlier part of the season has been more than fulfilled and the crop will be one of the best ever harvested in the State. The warm weather during September and the absence of killing frosts until late in the month assisted in ripening the crop, and the late fields matured in good shape. The stover is luxuriant and is generally reported as well filled with ears, which are also well filled out. Barnstable County is the only section of the State where the condition is not above average, and the production of that county is so small as not to materially affect the general estimate. Sweet corn and fodder corn have also done well and silos are well filled in all sections.

ROWEN AND FALL FEED.

Rowen was, as a whole, much benefited by the rains during the month, and is generally a good crop. Much has been injured by wet weather after cutting, but the increase in the crop probably balances any loss in this direction. Grass

fields and meadows can safely be said to be in better condition, after cutting the rowen crop, than for several years, and the promise for next year is now good. The heavy rains have put fall feed in excellent condition, many correspondents stating that it never looked better at this time of year.

FALL SEEDING.

The ground was not in the best condition for fall seeding during August and the heavy rains of the past month have delayed it in some localities, but, nevertheless, nearly, if not quite, the usual amount has been done. Wherever it is in a good catch is reported and the condition is generally spoken of as excellent. Newly seeded lands should start next spring in unusually good condition.

ONIONS.

Onions are, on the whole, considerably below an average crop, many correspondents speaking of them as one-half or two-thirds of an average. The sections of commercial production show, if anything, the most marked decrease. The quality of the crop is good as a rule. Prices do not seem to be fully established as yet, but appear to be rather better than last year.

POTATOES.

Potatoes cannot be said to be an average crop in either yield or quality, though quality is more nearly up than quantity. Drought was the principal cause tending to reduce the yield, very few fields recovering from the drought of the fore part of the season. Rot is reported in many localities and tends to reduce both yield and quality. There is also much complaint of the small size of the tubers, scab and the work of wire worms and white grubs.

ROOT CROPS, CELERY, ETC.

Root crops generally promise well and a full yield may be expected. Some correspondents speak of turnips as being particularly good. From Middlesex County comes the report that celery is in excellent condition, and this is borne out by reports from other sections not so important as centres of production. In Worcester, however, it has blighted

badly. The recent rains seem to have put all late market-garden crops in good condition, and good yields may be expected for all crops not yet harvested.

FRUITS.

Apples have dropped but little considering the number originally on the trees, and a very large crop is promised in most sections. The quality is very good indeed, the fruit being fair, smooth-skinned and free from worm holes. About the only fault complained of is small size, caused by the great number of apples on the trees. There were few pears and practically no peaches. Grapes apparently did not come up to expectations and the crop is hardly up to the average. There is some complaint of dropping. Cranberries, particularly on Cape Cod, also appear to have gone back in condition, and at time of picking not more than a fair crop was promised. There are a number of complaints of injury from hail and heavy rains.

THE ARMY WORM.

A third brood of the army worm has appeared on late Hungarian grass, barley and other late forage crops, and to a less extent on grass lands. They are quite generally distributed over the State but do not appear to have done as much damage as where they appeared earlier in the season. However, there would seem to be good ground for fearing that they will be more likely to appear next spring in localities where this brood was the first one noticed than where they were destructive earlier in the season. All fields where this brood appeared should be carefully watched next spring and strict repressive measures adopted on their first appearance. It would also be well to burn over grass fields on which they have appeared this year early in the spring, with a view to destroying the pupæ and hibernating caterpillars. Those desiring fuller information as to the habits of the creature and the remedies which may be applied are referred to our Crop Report for July, Bulletin No. 3, Series of 1896, which contains an interesting article on the army worm by A. H. Kirkland, M.S., assistant entomologist to the committee on gypsy moth, birds and insects.

NOTES OF CORRESPONDENTS.

[Returned to us September 25.]

BERKSHIRE COUNTY.

New Marlborough (L. P. KEYES). — Indian corn is much above the average of former years. I never saw rowen and fall feed looking as well as now. A large amount of fall seeding has been done and it looks very promising. Onions are far below an average crop. Potatoes are about half a crop and the quality is not as good as usual. Root crops, celery and other late market-garden crops promise well. Apples are an excellent crop and the fruit was never fairer or more perfect in shape. Grapes are also looking well.

Sheffield (DWIGHT ANDREWS). — Indian corn is fully an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is looking well. Onions are about three-fourths of an average crop. Potatoes are not up to the average in yield but are of good quality. Root crops are looking well and late market-garden crops are a full average. Apples are a full crop, pears and peaches short, grapes good and cranberries short.

Alford (L. T. OSBORNE). — Indian corn is rather better than the average and sowed corn has a larger acreage and better yield. Rowen and fall feed are much above the usual condition. More than an average amount of fall seeding has been done and the condition is very fine. Potatoes are a three-fourths crop of medium quality. Apples are more than a full crop and are selling for sixty cents per barrel in the pile.

Otis (S. H. NORTON). — Corn is a full average crop. Rowen is above an average crop and fall feed is good. About the usual amount of fall seeding has been done and it is looking finely. Potatoes are not an average crop, being small, with some rot. Apples are a large crop of very fine quality.

Stockbridge (F. A. PALMER). — Corn is up to and above an average crop. Rowen and fall feed are both above the average. The usual amount of fall seeding has been done and the rains have kept it looking finely. Potatoes are a very light crop here. Celery looks well. Apples are more than an average crop, grapes fair, pears light and no peaches. There have been no frosts to injure crops and everything is growing nicely. Clover and other grasses are starting well in meadows where the dry seasons had killed them out.

Washington (E. H. EAMES). — Indian corn is a much better crop than for the last two years. Rowen and fall feed are in better condition than for three years past. The usual amount of fall seeding has been done. Potatoes are a light crop, the tubers being small and rotting badly. Apples and pears are plenty. A black bug has been attacking the potato beetle and killing them by thousands. What the ultimate outcome will be we cannot tell, but we have hopes that they will be of great assistance in holding the beetle in check.

Cheshire (L. J. NORTUP). — Corn is a full average crop and is all cut and most fields ready to husk. Rowen and fall feed are much better than for years past. More than the usual amount of fall seeding has been done and is looking well. The potato crop is nearly one-third off from last year and is rotting. Turnips are a good average crop. No celery is raised for market but that raised in gardens promises well. Apples are a good crop in both quantity and quality. The practice of fall seeding is growing in favor. Fodder corn is being raised more extensively than formerly on account of short hay crops and it helps out a full crop as well.

FRANKLIN COUNTY.

Rowe (J. F. BROWN). — Indian corn is about an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Potatoes are not an average crop in either yield or quality. Root crops, celery and late market-garden crops promise well. Apples, pears, peaches and grapes are light crops, but cranberries are a good crop. Buckwheat is a good crop.

Charlemont (H. S. GILES). — Corn is more than an average crop but is late in maturing. The rowen crop and fall feed are not up to the usual average. The usual amount of fall seeding has been done and is looking well. The onion crop is about the same as in previous years. Potatoes range from one-half to seven-eighths of a full crop and the quality is very good. The prospect

for root crops is very good. Apples and pears are good crops, grapes a large crop and not many peaches.

Conway (J. C. NEWHALL). — Indian corn is a full average crop. Rowen and fall feed are above the usual average. The usual amount of fall seeding has been done and it is looking finely. Onions are less than an average crop. Potatoes are far below the average in both yield and quality. Root crops, celery and late market-garden crops promise fairly well. Apples are the greatest crop ever known but other fruits are not average.

Whately (FRANK DICKINSON). — Indian corn is more than an average crop. Rowen was less than an average crop but fall feed is good. A small amount of fall seeding has been done and it is in fine condition. Onions are a good crop but not up to the average. Potatoes are below the average in yield but of good quality. Late market-garden crops look well. Apples and grapes are very heavy crops.

Leverett (W. L. BOUTWELL). — Indian corn is 90 per cent of a full crop. Rowen is rather better than an average crop and fall feed is extra good. The usual amount of fall seeding has been done and is in good condition. Onions are about 80 per cent of an average crop. Potatoes are not over half a crop and the quality is very poor. Root crops, celery and other late market-garden crops promise fairly well. Apples, pears and grapes are very good crops.

Montague (C. S. RAYMOND). — Corn is a full average crop. Rowen and fall feed are up to the usual average. About the usual amount of fall seeding has been done and the condition is very good. Onions are about 80 per cent of an average crop. Potatoes are about a three-fourths crop and the quality is good. There are few root crops raised and not much celery, but what little there is are average crops. Apples are an abundant crop and grapes plenty. We have had a very good season for all crops except the first crop of hay. I think the failure of potatoes and onions is more owing to blight than anything else, and that comes in good seasons as well as bad.

Orange (ANSEL HARRINGTON). — Indian corn is a full average crop. There was more than the usual amount of rowen and fall feed is very good. There has not been quite as much fall seeding done as usual but its present condition is fairly good. Potatoes are not more than a three-fourths crop but the quality is very good. Root crops, celery and other late market-garden crops are about the same as usual. Apples are a very large crop, grapes about average and other fruit scarce.

HAMPSHIRE COUNTY.

Pelham (J. L. BREWER). — Indian corn is a very good crop. Rowen and fall feed are well up to the usual average. Fully as much fall seeding has been done as usual and we are having favorable weather for grass growth. But few onions raised and the crop is a failure. Potatoes are not an average crop though late ones are good. Root crops, celery and other late market-garden crops promise better than for a few years past. Apples good, few pears or grapes, cranberries good. The first killing frost occurred on September 23.

Amherst (F. S. COOLEY). — Corn is not generally stooked but harvesting is progressing rapidly. Ripening was retarded by cool, rainy weather, but in the absence of frosts a fine crop is promised. Rowen and fall feed are better than average crops. About the usual acreage has been seeded this fall and the catch is uncommonly good. Blight has greatly injured the onion crop. Potatoes are about an average crop though the tubers are small on many fields. The prospect for root crops, celery and other late market-garden crops is excellent if the autumn is fairly mild. Apples fine, grapes better than an average, pears scarce and no peaches. Tobacco was harvested in good condition, and is curing well.

Hudley (L. W. WEST). — Indian corn is above the average both in acreage and yield. Rowen and fall feed are far above the average. The usual amount of fall seeding has been done and is in good condition. Onions are below an average crop. Potatoes are about a two-thirds crop of poor quality. The prospect for root crops, celery and other late market-garden crops is good. Apples and grapes are good crops, no peaches, pears very light.

Westhampton (F. A. BRIDGMAN). — Indian corn is a fair crop. Rowen and fall feed are up to the usual average. About the usual amount of fall seeding has been done and is looking about average. Potatoes are not as good a crop as usual. Apples are very abundant, grapes plenty, no pears or peaches, not many cranberries.

Williamsburg (F. C. RICHARDS). — Corn is much more than an average crop. Rowen and fall feed are up to the usual average. But little fall seeding has been done. Potatoes are far below average both in yield and quality. So far as raised here root crops, celery and other late market-garden crops are promising well. Apples are a heavy crop but the wind and rain of the 19th took enough from the trees to quite materially lessen the quantity which will be placed on the market.

Chesterfield (HORATIO BISBEE). — Indian corn is much above an average crop. Rowen and fall feed are better than usual. The

usual amount of fall seeding has been done and is in good condition. Potatoes are nearly an average crop but are not as good as last year. Apples are a good crop and the fruit has matured early.

HAMPDEN COUNTY.

Chester (P. M. ADZIMA). — Indian corn is more than an average crop. Rowen is better than an average crop and fall feed is up to the usual average of condition. About the usual amount of fall seeding has been done and the condition was never better. Onions are about an average crop. Potatoes are about a third short in yield but of average quality. The prospect for late market-garden crops is very good and root crops are average. Apples half a crop, and pears, peaches and grapes good. The past month has been cloudy, with a heavy rainfall.

Westfield (C. F. FOWLER). — Corn is a full average crop. Rowen is more than an average crop and fall feed was never better. The usual amount of seeding has been done this fall and it looks unusually well. On most potato fields the tubers turn out well in number but are small in size, and a few fields are reported as not worth digging. Beets are hardly up to the average in condition. Celery is doing well. Apples are very plenty and fine, pears scarce and grapes fairly good.

West Springfield (N. T. SMITH). — Indian corn is a full average crop. Rowen is above the average, with the exception of some fields, which were injured by the white grubs. The average amount of fall seeding has been done and it has started well. Onions are three-fourths of an average crop, being under sized. Potatoes are about 80 per cent of an average crop, some pieces being badly grub eaten, while others are scabby. Root crops, celery and other late market-garden crops promise well both as to yield and quality. There is a remarkably heavy crop of apples where the trees did not bear last year. The fruit is coloring well and is of superior quality but prices are very low. Grapes and cranberries are generally good yields.

Chicopee (R. W. BEMIS). — Indian corn is a good crop. Rowen and fall feed are both above the average. The usual amount of fall seeding has been done and it is now looking finely. Onions are a good crop. Potatoes are an average crop both in yield and quality. The prospect for all root crops is good. Apples are a large crop, pears short, grapes and peaches a fair average.

Wilbraham (F. E. CLARK). — Corn stover is heavy but it is not eared out quite in proportion; on the whole about an average crop. There is a remarkably good crop of rowen. Fall feed is

fine and the milk supply has kept up well. More than the usual amount of fall seeding has been done and it is looking finely. Potatoes are not more than half a crop in quantity but the quality is good. All root crops are looking well and turnips are especially fine. Apples are a full crop on the mountains but there are few on the plains; perhaps a two-thirds crop in all. No peaches, very few pears, grapes a full crop.

Monson (W. M. TUCKER). — Indian corn is above an average crop and is nearly all cut. Rowen is a good crop where the first crop was cut early, but it is not all cut yet. Not so much fall seeding has been done as in previous years but it is looking well. Potatoes are not an average crop and are poor in quality. Root crops, celery and other late market-garden crops are good, though not much is raised for outside markets. Apples are a very good crop, no peaches, few pears, grapes abundant and fine; a few cranberries, which are rotting somewhat.

Holland (WM. S. WALLIS). — Indian corn is fully an average crop. Rowen and fall feed are above the usual average. Less than the usual amount of fall seeding has been done, it having been too dry until lately. Potatoes are a very light crop. Root crops, celery and other late market-garden crops are not raised to any great extent. Apples and cranberries are large crops, few pears and no peaches.

WORCESTER COUNTY.

Southbridge (G. L. CLEMENCE). — Indian corn is an average crop but a little late in ripening. Fall feed is good but rowen is a little short of an average crop. The usual amount of fall seeding has been done and the condition is good. Potatoes are light in yield but of good quality. Apples are a very large crop, pears short, no peaches and grapes average.

Warren (W. E. PATRICK). — Indian corn is probably 10 per cent above an average crop. Rowen and fall feed are above the usual average. Less fall seeding has been done than usual and it is not looking well on account of the lateness of seeding. Onions are not more than half a crop. Potatoes are not quite up to the average in yield and quality. Celery and other late market-garden crops are looking well. Apples are an immense crop; other fruits very light.

Hardwick (F. A. RUGGLES). — Corn has eared out well and is fully up to the average of last year. Rowen and fall feed are more than the usual average. More than an average amount of fall seeding has been done and is looking finely at the present time.

Onions are not more than half the crop of last year. Potatoes are about half of last year's yield and are rotting badly. Root crops, celery and other late market-garden crops are looking well. Apples are an abundant crop; no pears, peaches or grapes here.

Templeton (LUCIEN GOVE). — Corn is a full average in quantity but the quality is rather below the average, owing to wet, cloudy weather. Rowen and fall feed are better than for the last three years. The usual amount of fall seeding has been done and the condition is extra. Potatoes are not so large a yield as last year but are an average crop; some complaint of scab, grubs and a little rot. Root crops promise to be good. Apples extra, pears light, no peaches, grapes fair but dropping badly. Tomatoes have cracked badly, owing to the wet weather. Squashes are rather small. Beans rusted, owing to the wet weather. If prices were satisfactory our farmers would have very good prospects before them.

Winchendon (W. H. SAWYER). — Corn is more than an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is looking well. Potatoes are about average in quantity, though not up to last year, and of average quality. The prospect for root crops, celery and other late market-garden crops is very good. Apples are plenty but other fruit is scarce. More corn has been put into the silo than ever before and the crop was got in good shape, without injury from frost.

Westminster (I. DICKINSON). — Indian corn is more than an average crop but is late. Rowen and fall feed are better than for a number of years past. Not much fall seeding has been done yet on account of the rainy weather. Potatoes are less than an average in quantity but of good quality. Root crops, celery and other late market-garden crops promise well. Apples are abundant, pears light, no peaches, grapes light and cranberries good.

Holden (G. S. GRAHAM). — Indian corn is a good average crop, if not more. Rowen and fall feed are above the usual average. About the usual amount of fall seeding has been done and it is looking well. Potatoes are good in quality but the yield is not a heavy one. All root crops are looking well. There is no end to the crop of apples and grapes. The white grub is eating potatoes badly.

Worcester (S. A. BURGESS). — Indian corn is a little above an average crop. Rowen and fall feed are more than average crops. Not quite as much fall seeding as usual has been done as yet but it is looking well. Onions are a fair average crop. Potatoes are not quite up to the average in yield and quality. The prospect

for root crops, celery and other late market-garden crops is good. Winter apples are not yet picked but the crop is good. Pears are a small crop, no peaches, grapes and cranberries fair.

Southborough (E. F. COLLINS). — Indian corn is about an average crop. Rowen is a better crop than for several years. The usual amount of fall seeding has been done, and though backward it is now doing well. Potatoes are a large yield of good quality. Turnips are a good crop. Apple trees were so loaded that the fruit is small though fair. Army worms have done a great deal of damage to late Hungarian grass and have also overrun considerable grass land.

Upton (B. A. JOURDAN). — Indian corn is a good crop and the ears are well filled out. Rowen and fall feed are above the usual average. The usual amount of fall seeding has been done and is looking finely. Onions are a good crop though little raised. Potatoes are an average crop in yield and quality. Root crops, celery and other late market-garden crops promise well. Apples are a heavy crop, pears and peaches very light, grapes and cranberries good.

Douglas (WM. ABBOTT). — Corn is more than an average crop. Rowen and fall feed are up to the usual average. About the usual amount of fall seeding has been done but the condition is not as good as usual. Onions are fully an average crop. Potatoes are an average crop in yield but the quality is poor in most cases. Root crops are good and celery looks well though it is rather late. Apples are the largest crop on record though they have dropped badly. Pears and peaches are of no account but cranberries are fair. There has been plenty of rain during the past month. Harvesting is nearly completed with the exception of apple picking.

MIDDLESEX COUNTY.

Dunstable (A. J. GILSON). — Indian corn is fully an average crop. Rowen and fall feed are fully up to the average. A good amount of fall seeding has been done and it is looking finely. Onions are below an average crop though few are raised for market. Potatoes are rather below the average in quantity; quality very good though the white grub has eaten them badly. Turnips are looking well. Apples are abundant, no pears or peaches, grapes and cranberries rather above the average.

Westford (ARTHUR WRIGHT). — Indian corn is better than last year. Rowen and fall feed are up to the usual average. The average amount of fall seeding has been done and is in good condition. Onions are a good average crop. Root crops, celery and

other late market-garden crops are all looking well. Apples are an enormous crop, no peaches and very few pears. The army worm has made its appearance in two localities but I do not hear of its spreading very much.

Lincoln (SAMUEL HARTWELL). — Rowen and fall feed have much improved during the month and are now average crops. About the usual amount of fall seeding has been done and it is looking well. Potatoes are an average crop in quantity and quality. Root crops, celery and other late market-garden crops promise to be very abundant. Apples and grapes are plenty, few pears and no peaches.

Wilmington (E. N. EAMES). — Indian corn is about an average crop. Rowen and fall feed are up to the usual average. The average amount of fall seeding has been done and is looking well. Potatoes are not an average crop in either yield or quality. Root crops, celery and other late market-garden crops promise well. Apples are a large crop of very good quality and cranberries are an average crop.

Woburn (W. H. BARTLETT). — Only sweet corn is raised here and that is an average crop. Rowen and fall feed are better crops than usual. About the usual amount of fall seeding has been done and it is now looking very well indeed. Potatoes are a small yield of small tubers but the quality is good. Root crops, celery and other late market-garden crops are all doing finely. Apples are a heavy crop though the fruit is smaller than usual. There are few pears and no peaches, and cranberries are a fair crop. The frost of the 23d and 24th killed all tomato and squash vines, grapes, etc. Squashes are a light crop. Cabbages fair but wormy. Stock is in good condition.

Arlington (W. W. RAWSON). — Onions are a fair crop. The prospect for root crops is good. Since the rains have come all crops are improving and I think all fall and winter crops will be more than average. Celery never looked finer.

Newton (OTIS PETTEE). — Indian corn compares favorably with former years. Rowen was a rather light crop but late rains gave it new life. Considerable fall seeding is already in. Root crops, celery and other late market-garden crops are doing very well. There is an abundance of apples and grapes, and but few pears or peaches.

Sherborn (N. B. DOUGLAS). — Indian corn is 10 per cent above the average. Rowen and fall feed are up to the usual average. Fall seeding is late and we cannot yet tell as to its condition. Potatoes were a small yield but the quality is good. Root crops, celery and other late market-garden crops look well but are little

grown. Apples an immense crop, few pears, no peaches, grapes and cranberries good. Late sown Hungarian grass and barley are very poor. Army worms, have appeared in all parts of the town but no great amount of damage is reported.

Hopkinton (W. V. THOMPSON). — Indian corn is about an average crop. Rowen and fall feed are not up to the usual average. The average amount of fall seeding has been done and it is looking well. Potatoes are below the average both in yield and quality. Root crops, celery and other late market-garden crops have suffered from dry weather. Apples are a very large crop, no pears or peaches and grapes fair. Army worms have made their appearance on Hungarian grass and late barley.

ESSEX COUNTY.

Haverhill (EBEN WEBSTER). — Indian corn is a full average crop. Rowen and fall feed are about up to the usual average. About the usual amount of fall seeding has been done and it is looking well. Potatoes are an average crop both in yield and quality. Celery and other late market-garden crops are looking well. Apples and grapes are abundant.

Salisbury (WESLEY PETTENGILL). — Indian corn is better than an average crop. Rowen is hardly up to the average, and fall feed is in only fair condition. Less than the usual amount of fall seeding has been done, but what has been sown is looking well. Onions are rather below the average. Potatoes are not an average crop in either yield or quality. The white grub has been quite troublesome and has eaten potatoes badly, especially on sod land. Apples are a great crop of smooth fruit; few pears; no peaches; grapes looking well and cranberries fair.

Newbury (G. W. ADAMS). — Indian corn is a full average crop. Rowen and fall feed are not up to the usual average. The average amount of fall seeding has been done, but it is rather backward in condition. Onions are about half a crop. Potatoes are about 60 per cent of a full crop. Root crops, celery and other late market-garden crops are very good on high land, but frosts have touched those on low ground a little. Apples are a large crop, very few pears and peaches, grapes nearly a full crop.

Danvers (C. H. PRESTON). — Indian corn is an average crop. Rowen was rather a small crop. Fall seeding was necessarily late on account of the dry weather, but is looking well. Potatoes are rather under the average in yield and quality. Root crops, celery and other late market-garden crops promise well. Apples are a large crop, but other fruits are very light.

Manchester (JOHN BAKER). — Corn is a good average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done, and it is looking well. But few onions are raised here. Potatoes are an average crop both in yield and quality. Root crops, celery and other late market-garden crops promise well. Apples, pears and cranberries are all good crops.

Marblehead (W. S. PHILLIPS, JR.). — Indian corn compares favorably with the crops of former years. Rowen was not a particularly heavy crop, but fall feed is good. Not much seeding has yet been done, but the condition of that which is in is excellent. Onions are much less than an average crop, perhaps 60 per cent of the average. Potatoes are good in quality, but the yield is not up to that of last year. The prospect for root crops, celery and other late market-garden crops is very good. Baldwin apples are very abundant, but the fall varieties are rather scarce.

NORFOLK COUNTY.

Medway (MONROE MORSE). — Indian corn is a full crop. Feed was short in the early fall, but the rains have started it. Rowen started well, but hot dry weather cut it short. Fall seeding was delayed by drought and is very late, and much seed does not yet show. Potatoes did not fulfil the promise of their tops, and the crop is only average. Apples have dropped until the excessive crop promised is only a full one of good quality. Pears were light, peaches a total failure and grapes fair.

Millis (E. F. RICHARDSON). — There is a very heavy yield of Indian corn. The rowen crop is good and fall feed is better than average. About the average amount of fall seeding has been done and it is looking well. Potatoes are more than an average crop. Root crops, celery and other late market-garden crops are good. Apples, grapes and cranberries are more than average crops, but pears and peaches are less.

Medfield (G. R. CHASE). — Corn is slightly above the average, say 110 per cent. Rowen and fall feed are above the usual average. The average amount of fall seeding has been done and is in fair condition. Potatoes are an average crop in both yield and quality. The prospect for root crops, celery and other late market-garden crops is poor. Apples are an enormous crop, pears small, peaches a failure, grapes an enormous crop and cranberries average. The tomato crop is a failure, owing to frost and rotting. The retail price is high, 5 cents per quart even now.

Randolph (R. A. THAYER). — Indian corn is a good average

crop at the present time. We have a large crop of rowen, and fall feed is extra good. We have had an unusual amount of rain, and newly-seeded land looks very nice. Onions are not a full crop. Late potatoes are from one-half to two-thirds of an average crop. Most root crops are in good average condition, but celery is hardly up to the average. Apples are an extra crop, pears and peaches very few, grapes a good average crop, and cranberries about half a crop. The stormy weather injured the rowen crop very much, but has filled wells and springs and put grass lands and pastures in excellent condition.

Cohasset (E. E. ELLMS). — Indian corn is more than an average crop. Rowen and fall feed are above the usual average. The usual amount of fall seeding has been done and it is in excellent condition. Onions compare well with a good average crop. Potatoes are an average crop in yield and quality. The prospect was never better for root crops, celery and other late market-garden crops. The apple, pear, grape and cranberry crops are very heavy.

BRISTOL COUNTY.

Mansfield (WM. C. WINTER). — Corn stover is about average, but owing to drought at earing time the ears are very poorly filled out and are below the average. No rowen; pastures coming up and will be good soon. No seeding was done until within two weeks and it will be late and poor unless we have fine weather until late in the fall. Potatoes are of good quality but are below average in yield, being few in a hill. Root crops, celery and other late market-garden crops are all poor, owing to dry weather. Apples are generally good, pears light, no peaches, grapes good and cranberries fair.

Attleborough (ISAAC ALGER). — Indian corn is more than an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Potatoes are an average crop both in yield and quality. Root crops, celery and other late market-garden crops promise well. Apples, grapes and cranberries are fair crops.

Raynham (N. W. SHAW). — Indian corn is fully up to an average crop. Rowen and fall feed are below the usual average. The usual amount of fall seeding has been done and is in very good condition. Onions are not a full crop. Potatoes are not up to the average either in yield or quality. Root crops, celery and other late market-garden crops promise to be very good. Apples are a full crop, no peaches, few pears, grapes a large crop and cranberries a good crop.

Somerset (JOSEPH GIBBS). — Indian corn is a full average crop. Rowen and fall feed are more than average crops. About the usual amount of fall seeding has been done and is in good condition. Onions are about 90 per cent of an average crop. Potatoes are an average crop both in yield and quality. Root crops, celery and other late market-garden crops are all right as far as the yield is concerned but the prices will not pay the cost of production. Apples are plenty, pears one-fourth of a full crop, and no peaches.

Acushnet (M. S. DOUGLAS). — Corn is not up to an average crop, worms having worked it badly. Rowen and fall feed are more than up to the average in condition. The usual amount of fall seeding has been done and its present condition is good. Potatoes are not up to the average in yield and quality. Apples, grapes and cranberries are good crops.

Dartmouth (L. T. DAVIS). — Indian corn is a full average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in first-class condition. Onions are a fair average crop. Potatoes are fully average in quality but hardly so in quantity. The prospect for root crops, celery and other late market-garden crops is very good. Apples and other fruits have maintained the promise held out earlier in the season.

PLYMOUTH COUNTY.

Hingham (AARON LOW). — Indian corn is a fair crop. Rowen is a larger crop than usual and fall feed is also above the usual average. There has been but little fall seeding done as yet. Onions are below the average. Potatoes are below the average in quantity but are of good quality. Root crops, celery and other late market-garden crops are not up to the usual condition. There is an immense apple crop but few pears or peaches. The past season has been very unfavorable for most crops on account of the severe drought continuing so long, causing almost a total failure in many market-garden crops.

Brockton (DAVIS COPELAND). — Indian corn compares well with an average crop. Rowen and fall feed are not quite up to the usual average. The usual amount of fall seeding has been done and its present condition is good. Onions are about a three-fourths crop. Potatoes made a light yield but the quality was good. Root crops, celery and other late market-garden crops were much injured by the dry weather, but those that lived through it now look well. Apples are a good crop, no pears or peaches, and cranberries good.

Hanson (F. S. THOMAS). — Indian corn compares well with an

average crop. Rowen and fall feed are fully up to the usual average. The usual amount of fall seeding has been done and is in good condition. Potatoes were a fair crop but badly eaten by worms. Root crops, celery and other late market-garden crops promise to be good. There are a great many apples, no peaches, few pears and a great many grapes and cranberries.

Lakeville (ELBRIDGE CUSHMAN). — Indian corn is very much superior to an average crop. It has been ideal corn weather during August and September. Rowen and fall feed have had plenty of rain and are above the usual average. The usual amount of fall seeding has been done and it is in good condition. Onions are a full average crop. Potatoes are hardly up to the average either in yield or quality. The prospect for root crops, celery and other late market-garden crops is good. Apples are abundant, no pears or peaches, grapes and cranberries good.

Carver (J. A. VAUGHAN). — Indian corn is a good average crop. Rowen and fall feed are above the usual average. The usual amount of fall seeding has been done and it has taken well. Potatoes are an average crop both in yield and quality. The prospect for root crops, celery and other late market-garden crops is good. Apples were nearly all blown from the trees by the squall of the 19th inst. Cranberries are not all picked yet but the crop about here is turning out well.

Wareham (A. B. SAVARY). — Indian corn is rather below an average crop. Rowen is rather below the average and fall feed is in good condition. The usual amount of fall seeding has been done and is in good condition. Potatoes are below the average in yield and in some places badly eaten by grubs. Root crops are in fair condition. Apples are an average crop, few pears or peaches, grapes good and cranberries average. The wet weather has delayed harvesting and some cut rowen was ruined; very little has been harvested in good shape.

BARNSTABLE COUNTY.

Sandwich (J. R. HOLWAY). — Indian corn is from one-half to two-thirds of an average crop. Rowen and fall feed are up to the usual average. The average amount of fall seeding has been done and it is in good condition. Onions are about half a crop. Potatoes are a very small crop but the quality is good. The prospect for root crops, celery and other late market-garden crops is good. Apples and pears are fair crops, few peaches, grapes very plenty and cranberries below average. White grubs are unusually plenty and mowings and pastures are badly eaten.

Mashpee (W. F. HAMMOND). — Indian corn is an average crop.

Fall feed is about up to the average but rowen is below. There has not been the usual amount of fall seeding done. Onions are more than an average crop. There will be about half a crop of potatoes but the quality is good. Root crops are looking well and will be about average. Apples and grapes are half crops, pears a full crop, no peaches and cranberries half a crop. The hail storm of the 19th inst. damaged a number of the bogs, knocking off two-thirds or more of the berries.

Dennis (JOSHUA CROWELL). — Indian corn is about an average crop. Rowen and fall feed are above the usual average. There is not much fall seeding done here but the condition is very good. Onions are below the usual average. Potatoes are an average crop both in yield and quality. The prospect for root crops, celery and other late market-garden crops is very good. Apples are very plenty and cranberries are an average crop. Cranberry picking is somewhat delayed by the unfavorable weather and the late fruit is all on the vines; prices very low.

Brewster (J. H. CLARK). — Indian corn is fully an average crop. Rowen and fall feed are both up to the usual average. The usual amount of fall seeding has been done and is in very good condition. Onions are as good a crop as usual. Potatoes are average in yield but white grubs and scab are quite general. Root crops, celery and other late market-garden crops are in very good condition. Apples, grapes and cranberries are very good; pears and peaches poor.

Wellfleet (E. S. JACOBS). — Rowen has been much damaged by rain. Fall seeding looks well and pastures and fall feed are in good condition. Onions are more than an average crop. Potatoes are rather a poor crop and have rotted some. The prospect for turnips is good. Apples are very scarce. Cranberries are very plenty and picking has just commenced.

Truro (D. E. PAINE). — Rowen and fall feed are not up to the usual average. The average amount of fall seeding has been done and is now in fair condition. Onions compare favorably with an average crop. Potatoes are an average crop both in yield and quality. There is a fair yield of all kinds of fruit.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Indian corn is less than an average crop. Rowen and fall feed are fully up to the average in condition. Potatoes are below an average crop both in yield and quality. The prospect for root crops, celery and other late market-garden crops is good. Apples and grapes are less than average crops.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

THE BABCOCK MILK TESTER; ITS VALUE AND
IMPORTANCE TO THE PRODUCER OF AND DEALER
IN SALE MILK.

By GEO. M. WHITAKER, *Assistant Executive Officer of the Dairy Bureau.*

The dairy literature which the Babcock milk tester has suggested has been almost entirely in the interests of the butter maker. Differences in the butter product of different cows have been emphasized, and many cows have been shown to be unprofitable; this has enabled the dairyman to weed out inferior animals and secure a greater production of butter at less cost and, in some cases, with fewer animals. This test has also made possible a more careful study of the by-products of the dairy (skim-milk and buttermilk), and this has helped the butter producer to prevent waste and to carry on his work with greater profit.

But this valuable process can be of much service in the sale milk business, especially where large cities have made the production of sale milk an industry of great magnitude. Though the farmer who produces milk for market may not find the Babcock tester of as much value as does his butter-making brother, yet it can be of more importance on the milk farm than has been commonly supposed. These milk testers are now so cheap that they are within the means of any one who has considerable interests at stake in the producing, selling or buying of milk. They can be of great service to the milk seller, and even to the purchaser, as well as to the producer. The hotel, restaurant, public institution and other users of milk can, by the use of the Babcock tester, be assured of the quality of the milk they buy. With the Babcock tester the retail peddler can keep track of the quality of the milk he sells, and thus ward off all fears of inspectors; he can, if he wishes, guarantee a certain specific quality. If he can secure supplies of extra quality, and

can find customers who are willing to pay extra price if the quality is assured, he can warrant that the customer will receive what he pays for. With the Babcock tester the farmer can know what he is selling. If he ships to the Boston contractors, he can, by the use of the Babcock tester, remove much of the mystery which has hitherto enveloped the statute standard. He can keep supervision over the quality of his milk sales and can know whether he is sending standard milk or not. If he receives complaint from the contractors, he has proof from his own tests of the kind of milk that has left his farm.

In order to understand the use of the Babcock tester in the sale milk business, a few fundamental principles about milk must be understood. The milk of individual cows varies from day to day. If the milk of a cow were to be analyzed every day, and the results of those analyses represented pictorially by a line which should go up as the quality of the milk increased, and *vice versa*, the line would, speaking in a general way, be something like a row of V's: **VVVVVVV**.

This is a somewhat exaggerated statement, because the irregularities will not be as uniform as is indicated by the above, and because, as the period of lactation increases, the amount of solids in the milk will increase; but in a general way the above is a representation of the quality of milk from day to day of individual cows under normal conditions. Ordinarily this variation is inside of one per cent, and when a variation occurs in one direction one day, the pendulum usually swings the other way, and about as far, the next day. When the milk of several cows is considered we find that these variations in the different animals do not coincide, but where the milk of one shows an increase, this increase may be offset by the decrease in the quality of milk of another. Hence the mixed milk of a herd is more constant in quality than the milk of single animals, and does not vary much from day to day. Where the conditions of barn and feed are such that the cows can have an adequate amount of food under comparatively uniform conditions, when they are neither too cold in winter, nor obliged to tramp long distances in a dry pasture under a burning sun, annoyed by flies, for summer rations, the quality of the mixed milk of a herd is quite uniform the year around.

Variations in the quality of milk are largely due to variations in the amount of fat. The amount of the other solids is comparatively constant. While we frequently find a variation of 3 per cent or over in the fat, the variation of the other solids is usually less than 1 per cent. Ordinarily the amounts of solids not fat and fat increase together, though not in the same ratio; and speaking

in a very general way, ordinary milks have about the following general composition : —

Fat.	Solids not Fat.	Total.	Fat.	Solids not Fat.	Total.
2.50	8.75	11.25	4.00	9.40	13.40
3.00	9.00	12.00	4.50	9.50	14.00
3.50	9.25	12.75	5.00	9.60	14.60
3.70	9.30	13.00	5.50	9.75	15.25

We do not claim that this is absolutely accurate, but it is approximately so, and near enough for the purposes of the use of the Babcock tester in connection with the sale of milk of the statute standard. The statute standard of milk seven months in the year is 13 per cent of total solids, and from the above table we see that such milk would ordinarily have about the following composition : —

Fat,	3.70
Solids not fat,	9.30
Total,	<u>13.00</u>

Five months in the year the statute standard is 12 per cent, which, if normal, is made up about as follows : —

Fat,	3.00
Solids not fat,	9.00
Total,	<u>12.00</u>

These facts are embodied in the statute standard as passed by the Legislature last winter, which says : —

In all prosecutions under this chapter, if the milk is shown upon analysis to contain less than thirteen per cent. of milk solids, or to contain less than nine and three tenths per cent. of milk solids exclusive of fat, or to contain less than three and seven tenths per cent. of fat, it shall be deemed for the purposes of this act to be not of good standard quality, except during the months of April, May, June, July and August, when milk containing less than twelve per cent of milk solids, or less than nine per cent of milk solids exclusive of fat, or less than three per cent. of fat, shall be deemed to be not of good standard quality.

The Babcock tester gives only the amount of fat in milk, but from the above it will be seen that the fat is the element which varies the most, and that the amount of fat is practically the key to the situation. Milk having 3.70 per cent of fat will be up to

the statute standard of 13 per cent of total solids. Milk that tests 3.50 per cent of fat is on the danger line, but so near all right that under ordinary circumstances it would probably pass muster and would not get the seller into trouble, as a certain amount of leniency is necessarily allowed in all statutes of this kind. If a milk has 3 per cent of fat it will be satisfactory during the five months of the year in which the standard is 12 per cent of total solids. A man with a herd of Jerseys or Guernseys whose milk tests from 4.50 to 5 per cent of fat would be safe in guaranteeing milk of 14 per cent of total solids; if his milk has over 5 per cent of fat it has 15 per cent of total solids. If he lives where there are people who are willing to pay an extra price for an article of extra quality, he will run no risk in guaranteeing his milk to have 13, 14 or 15 per cent of total solids, as the case may be, and he can be assured that he is keeping up to the required quality by using his tester.

In the actual use of the Babcock tester it will not be necessary to go to the trouble and labor of testing milk every day. Where the herd remains unchanged and without any variation in conditions, and the milk of the different animals is thoroughly mixed, a test every three or four weeks will usually be sufficient to keep an accurate knowledge of the situation. On purchasing a new cow or on having any considerable number come in fresh, more frequent tests for a short time would be desirable. In case of trouble a daily test of each animal might be necessary for a short time, but this would be an exceptional condition of affairs. An intelligent and experienced milk producer, having substantially the same cows month after month will very soon get such an acquaintance with the quality of the milk of his herd as will enable him to keep close track of it with only occasional tests.

Farmers shipping milk to Boston occasionally receive notifications that the milk is below the required quality. When the farmer is testing the milk at regular intervals, and watching the conditions of his cows and their feed, he will know what quality of milk he is furnishing as well as the contractors, and when a complaint is received he will know that it is either a just complaint, or else that some one has been tampering with the milk or that there has been improper sampling at the other end of the line.

It is now generally understood by those who have studied the question of milk production the most exhaustively and the most accurately, that quality in milk is due more to the animal than the feed (assuming of course that under all circumstances the animal has enough to eat). Hence, if milk is deficient in total solids under ordinary conditions it is because there are poor cows in the herd. These must be found out and their places filled with better

ones, or else enough better ones must be added to the herd to bring up the average. Here is another use for the Babcock tester. By testing the different cows in his herd, and by the use of a few figures, the farmer can tell what to do to improve the quality of the milk he sells, and, if necessary, to bring it up to the standard.

To illustrate: suppose a farmer who is producing ten cans per day for the Boston market gets word that his milk is down to 12 per cent. As we have said, there is usually no great variation in the quality of the mixed milk of the same herd, and if the man has been using the tester he knew even before the contractors that he was running some risk in shipping such milk. But having received this notice he starts at once to test the different cows of the herd, and he finds at the outset that one large cow, in the flush of new milk, is giving two cans per day, which has only 2 per cent of fat. The approximate composition of her milk is fat, 2, solids not fat, 8.50, total, 10.50. One hundred pounds of the mixed milk of this herd giving 12 per cent milk has of fat 3 pounds. The cow whose milk has only 2 per cent of fat contributes one-fifth of the whole supply, or 20 pounds. Her milk therefore contains of fat one-fifth of 2 pounds, .40 pounds. The eighty pounds of milk from the other cows therefore contains 2.60 pounds. Now if he should replace that poorer milk with 20 pounds that has 4.50 per cent of fat, this would contain .90 pounds. One hundred pounds of that mixture would contain 3.50 pounds. This is 3.50 per cent, and though such milk would not be safely over the danger line, an improvement of three-fourths of one per cent would be shown (the milk having gained from 12 to about 12.75 per cent of total solids) and might be accepted.

To illustrate this principle farther: suppose that a farmer has 100 pounds of milk which tests 3 per cent of fat, and he desires to bring it up to 13 per cent of total solids. If he takes 50 pounds of such milk it will have of fat 1.50 pounds. Fifty pounds of 5 per cent milk would have 2.50 pounds. A mixture of half and half of 3 per cent and 5 per cent milk would contain 4 pounds. This would test 4 per cent of fat, and have approximately 13.25 per cent of total solids.

Again, suppose he takes one-third of the 5 per cent milk and two-thirds of the 3 per cent. Sixty-six and two-thirds pounds of 3 per cent milk would have of fat 2 pounds, and $33\frac{1}{3}$ pounds of 5 per cent milk would have 1.66 pounds, and 100 pounds of the mixture would have 3.66 pounds. In other words the mixture would have 3.66 per cent fat, and would have approximately 13 per cent of total solids.

In institute work, when this principle is explained, the question

often arises as to whether science can detect the watering of rich milk down so that it will contain an average amount of fat. In other words, can milk having 5 per cent of fat be watered so that it will have 3.70 per cent, the legal amount, without violating any law or without danger of detection? No. The statute prohibits all adulterations, and this form of adulteration can be detected.

A milk of rich quality would have, in 100 pounds, fat, 5 pounds, solids not fat, 9.6 pounds, total, 14.6 pounds. Now suppose we add to that one-fourth in water, or 25 pounds. We then have a mixture of 125 pounds containing the same total solids as the 100 pounds of milk, — 5 pounds of fat, 9.6 pounds of solids not fat, total, 14.60. This being the weight of the solids in 125 pounds, we find that 100 pounds of this watered mixture would have fat, 4 pounds, solids not fat, 7.68 pounds, total, 11.68 pounds. The solids not fat have been diluted in the same proportion as the fat.

The following shows in convenient form for comparison the three conditions in this case : —

	Natural Milk with 5 Per Cent Fat.	The same Watered one- fourth.	Natural Milk with 4 Per Cent Fat.
Fat,	5.00	4.00	4.00
Solids not fat,	9.60	7.68	9.40
Total,	14.60	11.68	13.40

It will be noticed that while in watering this milk the fat is reduced one-fifth, the solids not fat are reduced in the same proportion, down to 7.68. Ordinary milk with 4 per cent of fat should have over 9 per cent of solids not fat, and the discrepancy between 9.40 and 7.68 tells the watery story.

The chemist whose analysis reached such results as fat, 4, solids not fat, 7.68, total, 11.68, would have no hesitation in making oath that the milk was absolutely watered.

The Dairy Bureau recently secured the conviction of a person for selling two samples of milk which tested as follows : —

	No. 1.	No. 2.
Fat,	1.66	2.22
Solids not fat,	8.66	8.38
Total,	10.32	10.60

These were suspicious samples, and the chemist felt that there was a strong probability that the milk had been artificially watered. The producer of the milk, however, testified under oath that the milk had been under his control and supervision every moment from the time it was drawn from the cow — a Holstein — until the detective officer took the sample, and that no water had been added to what the cow put in it naturally. This did not save him from being adjudged guilty, because it is against the law to sell milk of less than average quality even if it is honest (?) milk.

For the purpose of enforcing the law milk that has been artificially watered from the pump or faucet, and that which has been naturally watered to an unreasonable extent, are treated alike; but there is a possibility that the above producer told the truth, and that the milk alluded to may have been free from artificial watering, because the solids not fat are considerably over 8 per cent.

In contrast with this was a case which the board of health had last year. It attracted considerable attention and sympathy in the town where the case was tried on account of the high standing of the farmer. The milk which he sold analyzed as follows: —

	No. 3.	No. 4.	No. 5.
Fat,	4.00	3.30	3.60
Solids not fat,	7.94	7.74	7.68
Total,	11.94	11.04	11.28

Although these three samples analyzed higher than the Nos. 1 and 2, alluded to above, the figures tell a more emphatic and unquestionable story of adulteration, because in each of these three latter samples the solids not fat are less than 8 per cent, which indicates very clearly that the milk was watered, especially when compared with such amounts of fat as 4 and 3.60 per cent.

The Dairy Bureau secured the conviction, a few weeks ago, of a restaurant keeper at Revere Beach for milk which tested: —

	No. 6.
Fat,	2.20
Solids not fat,	7.20
Total,	9.40

In this case the fat was substantially the same as in No. 2 above, but here the amount of solids not fat is as low as 7.20 while those in No. 2 were 8.38. This low amount of solids not fat establishes beyond any reasonable doubt the fact that this last sample (No. 6) was watered with malice aforethought. And though the attorney plead with the judge to place the case on file in consideration of the previous good reputation of his client, the evidence of the chemist was that a moral as well as a statutory offence had been committed, and this led the judge to impose the usual fine.

The purchaser of milk who has only the Babcock test cannot detect adulterated milk where the fat is of satisfactory quantity; nothing will do that surely but the chemical analysis, which discloses the ratio between the fat and the solids not fat; but where the purchaser suspects any trouble of this kind the use of the lactometer, which gives the specific gravity, will be of assistance. Normal milk should have a specific gravity of about 1.032; watered milk would be less.

The principles explained above will illustrate the dangerous competition to which honest farmers have to submit when whole milk is adulterated with skim-milk. We detect added water by a reduction in the solids not fat; but when skim-milk is added to whole milk the amount of solids not fat remains without much change. A milk containing 4 per cent or above of fat can receive a small mixture of skim-milk and the detection would be very difficult. We allude to this because there is strong suspicion in the minds of many that some of the large surplus of sale milk in Boston is due to the extending of whole milk with skim-milk. Every can of skim-milk which is used in this way creates a surplus of one can of whole milk, for which farmers get only the butter price. The milk contractors can hardly refuse to sell skim-milk to those who apply for it, with the plausible story of having to supply a baker or something of that kind. Unquestionably there is considerable food value in skim-milk of which the public would be deprived were this by-product to be excluded from the market, but we are sometimes inclined to believe that the injury caused by the fraudulent use of skim-milk is greater than the benefit which the public receives from the food value which there is in the skim-milk that finds its way to market.

Milk is sometimes tampered with by dishonest employees, who remove the top of a can after it has stood for some time, and then fill the can with water. Unquestionably some honest farmers have been prosecuted for such delinquencies of employees, in accordance with the well-recognized rule to which business men of every kind are subjected, that the principal is responsible for the acts of his

agent. Where a farmer, however, makes a careful study of the quality of the milk he produces, if it is not satisfactory on reaching the city, he has a clue on which to work in detecting possible dishonesty of carriers or others. The chemist will often be very conservative in stating positively that a sample of low-grade milk owes its poverty to "topping" and watering, because the variation in the proportions of fat and solids not fat is not as great as where a larger quantity of water has been added to milk. Still, when we find milk with an amount of fat less than might be expected from the solids not fat, particularly if the solids not fat are slightly below the normal, we have grounds for strong suspicions that the milk has been tampered with in this way. In the case of sample No 1, above, in which the fat was 1.66 per cent and the solids not fat 8.66 per cent, while there is a possibility that it might have been as the producer testified under oath, there are also reasonable grounds for strong suspicions that part of the fat had been removed and a small quantity of water added. With natural milk as low as 1.66 per cent of fat, we should hardly look for solids not fat as large as 8.66 per cent.

In this brief paper we have not attempted to discuss the composition of milk exhaustively or in a thoroughly scientific manner, but we have endeavored to present so much of a view of the composition of milk, and of some of the ways in which it is adulterated, as to help farmers who are selling milk to conduct their business more intelligently, by the help of the Babcock tester. With this they can always be on the safe side as to the quality of their product. Understanding the significance of the fat test and how to use it, they can keep themselves posted as to the quality of the product they are selling, and not be under the disadvantage of working in the dark.

SERIES OF 1896.

BULLETIN No. 6.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF OCTOBER, 1896.

ISSUED BY

WM. R. SESSIONS,
SECRETARY STATE BOARD OF AGRICULTURE.

BOSTON:

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1896.

CROP REPORT FOR THE MONTH OF OCTOBER, 1896.

OFFICE STATE BOARD OF AGRICULTURE,
BOSTON, MASS., NOV. 1, 1896.

Bulletin No. 6, Crop Report for the month of October, is herewith presented as the final issue for this season. It is hoped that this work has been of value to those who have received the bulletins, and with this hope and belief we expect to again take up the work in the spring of 1897. The sincere thanks of this office are extended to the correspondents who have aided us by their reports, and we confidently rely on their assistance in the future.

The special articles printed this season have been as follows: Bulletin No. 1, "Report of the Meetings of the Massachusetts Fruit Growers' Association," by Prof. S. T. Maynard; Bulletin No. 2, "The Grass Crop," by Dr. C. A. Goessmann; Bulletin No. 3, "The Army Worm (*Leucania unipuncta*)," by A. H. Kirkland, M.S.; Bulletin No. 4, "The Crow in Massachusetts," by E. H. Forbush; and Bulletin No. 5, "The Babcock Milk Tester: its value and importance to the producer of and dealer in sale milk," by Geo. M. Whitaker. Attention is called to the article in this issue on "Concentrated Feed Stuffs," by Dr. J. B. Lindsey, Department of Foods and Feeding, Hatch Experiment Station of the Massachusetts Agricultural College.

PROGRESS OF THE SEASON.

Report No. 142 (October, 1896) of the Statistician of the United States Department of Agriculture gives the general condition of corn as 90.5 per cent as against 91 for the month of September.

The returns of yield per acre of all wheat indicate a production of 11.9 bushels, which is six-tenths of a bushel less

than the preliminary estimate for 1895. The indicated quality for the country at large is 84.4 per cent against 85.7 last year. The crop is generally short in quantity and poor in quality, and it is worst in the great central region.

Cotton shows a decline of 3.5 points from the September condition, which was 64.2 per cent against 60.7 this month. Little or no top crop will be gathered in any of the States east of the Mississippi River. The crop will all be gathered by November 1.

Preliminary reports show a yield of 24.3 bushels of oats per acre, against 29.6 a year ago. Returns as to quality indicate a general average of 74.9. The average yield of rye indicated by the preliminary returns is 13.3 bushels per acre, against 14.4 bushels in 1895. The average for quality is 89.9, a loss of 2.5 points from that of a year ago.

The returns of yield per acre indicate an average yield of barley of 25.6 bushels, against 26.4 a year ago. The general average of quality is 79.4, against 91.5 last year. The crop is badly discolored in many localities, owing to heavy rains and hot winds.

The condition of buckwheat is 1.2 points above that of 1895 at this date, being 86, against 84.8 a year ago.

The general condition of Irish potatoes declined from 83.2 to 81.7 during September, as against 87.4 last year. The crop promises to be one of larger volume than usual, notwithstanding a small reduction in area reported in the preliminary returns made in July. A feature of the present outlook, encouraging to the producer, is the prospective shortage of the European crop, which will probably cause an increased demand for the export trade.

On the whole, sweet potatoes are in much better shape than in October, 1895.

The general condition of tobacco shows a decided falling off during September, the percentage, 76.9, being 4.6 points below that of the previous month. The crop is practically all housed at the time of this report and generally escaped frosting.

A further and general decline of sugar cane is shown by October returns. In Louisiana, the chief producing State, only about half a crop is indicated.

Rice fell off in condition from 76.5 to 68.6 per cent. Drought has been the principal cause of low condition.

The average condition of apples has remained practically stationary during September. The crop is heavy and of fine quality in the northern tier of States, and prices are extremely low.

In Massachusetts the average yield of rye per acre is given as 22 bushels; the average yield of oats as 33.5; the average yield of barley as 30; the average condition of buckwheat, October 1, as 100; the average condition of corn as 106; the average condition of potatoes as 71; and the average condition of apples as 97.

MASSACHUSETTS WEATHER, 1896.

(COMPILED FROM DATA FURNISHED BY THE NEW ENGLAND WEATHER SERVICE.)

January opened cold, and an unusually sharp cold wave prevailed from the 4th to the 8th. Peach buds were almost entirely killed and some damage was done to raspberries and blackberries. The rest of the month was milder. The ground was not protected by snow during the cold spell, but there was a slight covering during the rest of the month.

February was a rough, stormy month, with damaging floods, heavy snows and much rainy and cloudy weather. The heaviest rain and snow fall came on the 4th to 7th and the 29th to March 3d. A severe cold wave prevailed on the 17th and 18th. On the night of the 6th-7th hurricane signals were hoisted in Boston for the first time in the history of the Weather Bureau, and the wind reached a velocity of over 60 miles an hour.

March was typical of the month, though rougher and more stormy than usual. The rainfall was above the normal and the number of stormy days also in excess. The snowfall was more than usual and there was a fair snow covering till near the end of the month. The changes in temperature were rapid, but the daily ranges were not great.

The first and last parts of April were comparatively cool, with frequent frosts, but the middle of the month gave almost unprecedented heat for the season. The rainfall was

deficient, and at the end of the month grass and grain were feeling the effects of dry weather. The cool weather of the first and last of the month held the fruit buds in check, with good results.

Unusually fair, warm and dry weather prevailed over the greater part of Massachusetts during the month of May. There were light frosts in eastern districts on the 20th, 21st and 24th, but no damage was done. Only a trace of rain fell during the first two-thirds of the month, and much grass land suffered severely. Insect pests were reported as very plentiful. The frosts were not severe enough to damage fruit buds to any extent. Apples blossomed from a week to ten days earlier than the average.

The month of June gave nearly normal weather conditions over the greater part of the State. Many of the nights were too cool for the best growth of corn, but no damaging frosts occurred. High temperatures prevailed, but there was no excessive heat. Moderate showers were well distributed, and there was a general soaking rain on the 14th. At the end of the month, however, the top of the soil was getting dry. There were practically no damaging winds or local storms to injure the fruit.

Along the coast the mean temperature for July was below the normal, and the temperature range was small. The rainfall was below the normal along the coast, but was in excess in the interior. There was a good deal of foggy and cloudy weather, and the number of rainy days was more than usual. The high wind on the 16th did some damage to corn, grain and fruit in western counties. The month was a poor one for harvesting, but a splendid one for the growth of all field crops.

August opened with plenty of heat, sunshine and moisture. Unusually hot and sultry weather continued over the second week of the month, and most crops made a very rapid growth. The last half of the month was somewhat cooler and drier, with plenty of sunshine. There was a marked absence of severe local storms and no continuous rains. Streams and wells got very low, and the subsoil was very dry. The month was warmer and drier than the normal.

Light frosts occurred during September on several dates in valleys and on level plains, but there was no general kill-

ing frost. Rain was frequent and excessive in all districts, and the ground was well filled with water at the end of the month. At Boston the mean daily temperature was very near the normal. The weather was exceptionally favorable for the growth of late forage crops, and grass on old fields also thickened up. Local rain and thunder storms were frequent and damaging.

October has given an unusual amount of cloudy, stormy weather, although in eastern districts the total rainfall for the month is fully an inch below the normal amount.

A number of severe storms have passed near enough to us to give cloudy, threatening weather and some wind, but not near enough for us to get the worst part of the disturbance. The most noteworthy was the West India hurricane of the 12th to 16th. This was first noted over the West Indies on the 7th, and moved slowly up the coast well out to sea. Warning signals were ordered and displayed all along our coast, giving ample warnings of the gale. The wind reached hurricane force on our extreme eastern coast, while the centre of the storm was several hundred miles outside.

At Boston the mean temperature for the month averaged one and one-third degrees a day lower than the normal. The highest temperature was 76° on the 31st and the lowest 33° on the 26th. Killing frosts were noted over most of our district on the 19th or 20th, but as most of the crops were already gathered but little if any damage was done.

The weather has been unfavorable for curing corn and for getting the late forage crops and rowen, and that work has been somewhat delayed. The wet weather has been favorable for pastures and for fall-sown grain and grass seed, and the present outlook for pastures and grass fields for next season is very flattering. The ground is well filled with water, and wells and reservoirs are generally full and ready for winter weather.

CROPS OF THE YEAR.

During April farm work was carried on under favorable circumstances, and was well advanced at the end of the month. The season opened from one to two weeks earlier than last year.

Extreme drought prevailed during May, and checked the growth of crops. Feed in pastures was shortened, and old mowings showed very light. Fall seeding did not generally winter well. Apples and small fruits blossomed full, but other fruits were below the average. Insects, aside from canker worms, were not more than usually destructive. Spraying is practised only to a slight extent. Good help was a little more plenty than in former years. Wages averaged from \$16 to \$20 per month with board, and from \$1.25 to \$1.50 per day without board.

In June cut worms were reported as unusually prevalent and doing much damage, particularly on the tobacco fields of the Connecticut valley. Corn was backward but otherwise looking well, with about the usual acreage. There was an increase in the acreage of both fodder corn and ensilage corn. Haying had hardly begun, but the prospect was for a light crop. Potatoes showed a decreased acreage, but generally looked well. Early market-garden crops were generally good, with prices not advanced. Late ones promised well. Dairy products were about average in quantity, with a slight decrease in price. Pasturage was generally in good condition. Berries promised well; apples good; pears, plums and cherries light; no peaches.

A feature of the month of July was the appearance of the army worm in destructive numbers generally throughout the State. Indian corn was growing fast and an excellent crop was promised; more than usual used for ensilage. Haying not quite completed, and the crop three-fourths of an average. Quality generally good, though much damaged by rain. Forage crops all in excellent condition. Market-garden crops were generally in good condition. Early potatoes did not promise a full crop. Apples, grapes and cranberries good; other fruit light. Pastures generally in good condition. Rye, oats and barley all good average crops.

At the end of August Indian corn promised to be a very large crop. Rowen promised better than for some years. Late potatoes not average, owing to drought, blight and grubs. Tobacco was generally reported as the best crop for many years and secured in good condition. Apples and grapes promised a full crop; cranberries fallen off, but aver-

age; other fruit light. Pastures generally in good condition. Oats and barley, good average crops. In most sections but little attention is paid to poultry, it being regarded as rather a side issue.

During September corn was cut and stooked, and by October 1 husking had commenced. Crop one of the best ever harvested. Rowen generally a good crop, and fall feed in excellent condition. Fall seeding, wherever in, made a good catch and showed good condition. Onions considerably less than an average crop, with prices low. Potatoes were below average in yield and quality and much rot was reported. Root crops generally promised well. Late market-garden crops, including celery, in good condition. Apples a great crop of fine quality; grapes not average; cranberries also fallen off; other fruit poor. A third brood of army worms appeared in many localities and did considerable damage to late grain and Hungarian grass.

In the circular to correspondents returnable to this office October 25 the following questions were asked:—

1. Have root crops proved to be average crops?
2. What is the condition of farm stock?
3. What is the condition of fall seeding?
4. What proportion of the winter apple crop has been marketed, what proportion exported or sold for export, and what prices have been received?
5. How have prices for crops raised for market compared with former years?
6. Which of the leading crops in your locality do you think have been most profitable?
7. Which of the leading crops in your locality do you think have been least profitable?
8. Considered as a whole, has the season been a profitable one for your farmers?

Returns were received from 124 correspondents, from which the following summary has been made:—

ROOT CROPS.

On the whole, root crops are good average crops, most of the correspondents speaking of them as average. Out

of one hundred and twenty replies ninety-one speak of them as average, twenty-three as below average and six as above. Potatoes are generally spoken of as a light crop.

FARM STOCK.

The heavy rains of the past month have kept the pastures and fall feed fresh and green and farm stock consequently closes the season in good condition. There is not a single complaint of poor condition and the replies range from "average" to "never better." Pastures promise well for next year.

FALL SEEDING.

The same conditions which have operated to keep fall feed in good condition have been equally favorable to fall seeding. There are very few reports of poor condition and most correspondents say that it is very fine. A good catch was secured in all sections.

APPLES.

There was a very large crop of winter apples of excellent quality. Sales have been slow and probably the greater portion of the crop still remains in the hands of the growers. In many sections the bulk of the crop will be held until into the winter, with the expectation that prices will then improve. Correspondents vary widely as to price, but all agree that prices have been low. Perhaps a fair average of prices given would be seventy-five cents per barrel, including barrel. Not much information was obtained as to the export trade, but the statement is warranted that only a small portion of the crop was disposed of in this way and that the experiment was hardly a success. While some obtained good prices for the fruit exported, others received but a few cents per barrel and some nothing at all.

PRICES.

The general trend of prices seems to be lower than in former years. Out of one hundred and twelve answers seventy-six correspondents speak of prices as lower, twenty-four as average and twelve as higher. Potatoes bring higher prices than last year owing to the short crop.

MOST PROFITABLE CROPS.

Some correspondents say that they cannot tell which crops have been most profitable and others report that there has been no profit in anything. Sixty-six consider hay to have been among the most profitable crops ; 28, corn ; 14, potatoes ; 9, milk ; 9, cabbages ; 6, tobacco ; 6, sweet corn ; 5, strawberries ; 5, cranberries ; 4, asparagus ; 4, apples ; 3, oats ; 3, tomatoes ; 2, rye ; 2, onions ; 2, small fruits ; 2, lettuce ; 2, peas ; 1, barley ; 1, root crops ; 1, pole beans ; 1, spinach ; 1, quinces ; and 1, turnips.

LEAST PROFITABLE CROPS.

Fifty-five correspondents give potatoes as among the least profitable crops ; 36, apples ; 11, corn ; 4, squashes ; 4, onions ; 3, turnips ; 3, cranberries ; 2, cabbages ; 2, beans ; 2, peas ; 2, hay ; 1, cucumbers ; 1, tobacco ; 1, milk ; 1, rye ; 1, string beans ; and 1, fruit.

PROFITS OF THE SEASON.

The majority of correspondents seem to be of the opinion that the season has not been a profitable one. Crops have generally been good, but prices have been low and sales have not been particularly rapid. Tobacco, apples and other special crops are not yet sold and may or may not increase the profits of the season when disposed of, but at the present time the season does not show an average profit.

NOTES OF CORRESPONDENTS.

[Returned to us October 25.]

BERKSHIRE COUNTY.

Mount Washington (H. M. WEAVER). — Root crops have proved to be average. Farm stock is above the average of condition for this season of the year. Fall seeding is looking well. No apples have been sold as yet. Prices for farm products have been about the same as in 1895, but less than in former years. Oats and potatoes have been our most profitable crops, and corn our least profitable one. I do not think there has been much profit for farmers in this town this year, or in fact any year.

Lee (A. BRADLEY). — Root crops have been fully average. Farm stock is in good condition. Fall seeding is in much better condition than for many years. One-fourth of the apple crop has been sold at about 75 cents per barrel, without barrels. All sold have been for the home market. Crops have brought as good prices as in former years. Hay has been our most profitable crop, and potatoes our least profitable one. All things considered, the season has been a profitable one.

Hinsdale (S. M. RAYMOND). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding was never in better condition. About half the apple crop is marketed at from \$1 to \$1.50 per barrel. Prices have not been quite as high as in former years. Hay has been our most profitable crop, and potatoes our least profitable one. Considered as a whole, the season has been a profitable one.

Dalton (W. B. BARTON). — Root crops have proved to be average. Farm stock is in excellent condition, as there has been plenty of fall feed. Fall seeding has started well and is in good condition. Two-thirds of the apple crop has been sold at an average price of \$1 per barrel; none sold for export here. Prices have been lower than in former years. Hay and milk have been our most profitable crops, and potatoes our least profitable one.

The season has been a profitable one, considered as a whole. A few farmers are holding their apples in cold storage.

Williamstown (S. A. HICKOX). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in fine condition. Apples have been mostly marketed, and none were sold for export. Prices have ranged lower than in former years. Hay has been our most profitable crop, and potatoes our least profitable one. With high taxes and low prices the farmers find it hard to see where the profit comes in.

Florida (E. D. RICE). — Root crops are not up to the average, and potatoes are a failure. Farm stock is in good condition. Fall seeding is in good condition, owing to the rains. Apples have sold for about \$1.25 per barrel. Prices for crops raised for market have held their own this year. Grass has been our most profitable crop, and potatoes our least profitable one. Considered as a whole, this season has been an average one for profit.

FRANKLIN COUNTY.

Ashfield (CHAS. HOWES). — Root crops are above the average. Farm stock is looking remarkably well. Fall feed and new seedling never looked better. A good deal of rowen remains uncut, owing to the wet fall. A very few apples have been sold, mostly for export, at about \$1 per barrel. Prices have been lower than in former years. Hay has been our most profitable crop, and apples our least profitable one. The profit for the farmer is very small, as all crops and everything he has for sale are very low.

Deerfield (CHARLES JONES). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in extra nice shape. The apple crop is about half sold, and about one-fourth of those sold have been for export; prices from 75 cents to \$1 per barrel. Prices have been lower than in past years. Tobacco will be our most profitable crop if it can be sold at present prices. Corn has been our least profitable crop. The season has not been a profitable one, as prices are low on all crops. Onions are not quite an average crop, and sell from 35 cents to 40 cents per bushel. No '96 tobacco has been sold as yet.

Shelburne (GEO. E. TAYLOR). — Farm stock is in good condition. Fall seeding is in fine condition. But few winter apples have been sold and the price ranges from 75 cents to \$1 per barrel. Hay and corn have been our most profitable crops, and apples our least profitable one. All kinds of produce and meat are so low in the market that there is no profit in any of them.

Bernardston (R. H. CUSHMAN). — Root crops are an average,

except potatoes, which are the lightest crop of the year. Stock is in average condition and pastures hold out well. Fall seeding is looking well. Probably less than half the winter apples have been sold; the best fruit sells slowly at 75 cents per barrel, and the barrels cost from 25 to 35 cents apiece. Hay and corn have been our most profitable crops and potatoes our least profitable one. This has been a hard-times year for farmers.

Northfield (T. R. CALLENDAR). — Root crops are fully average. Stock is in good order and pasturage and fall feed are better than usual. Fall seeding is above the average in condition. Only a small proportion of the apples have been marketed, and prices range from 75 cents to \$1 per barrel. Most crops are selling at low prices. Tobacco promises to be our most profitable crop, and cucumbers have been least profitable. The season has been the most unprofitable on record.

Sunderland (J. M. J. LEGATE). — Root crops have not proved to be average crops. Potatoes are very light, and onions not over a two-thirds crop. Farm stock is looking well. Fall seeding is in splendid shape. Very few apples have been marketed, and those sold have brought 75 cents per barrel and the grower furnishes the barrel; very few sold for export. Prices have been a little higher than usual, but the shortage in yield has more than balanced the increase in price. Should the election go right, tobacco will be our most profitable crop. Corn has been our least profitable crop. Considered as a whole the season has been far from a profitable one.

HAMPSHIRE COUNTY.

Prescott (W. F. WENDERMUTH). — Root crops have hardly proved to be average. Farm stock is in very good condition. Fall seeding made a good catch and promises well. Very few apples have been sold at 75 cents per barrel; none sold for export. Prices are about 85 per cent of those of former years. Hay and corn have been our most profitable crops, and fruit, particularly apples, our least profitable one. Most farmers have made both ends meet, but little more.

Engfield (D. O. CHICKERING). — The potato crop is generally light; other root crops good. Farm stock is looking well. Fall seeding is in good shape and is looking very well. A few apples have been sold on the trees at from 30 to 35 cents per barrel; have heard of no sales of picked fruit as yet. Prices have been considerably lower than formerly. Hay and corn have been our most profitable crops, and potatoes our least profitable one. Crops as a whole have been above the average, but prices have been so low that there has been but little profit.

Belchertown (H. C. WEST). — Root crops have not proved to be average. Farm stock is in very good condition, especially cows in milk. Fall seeding is in remarkably good condition. Prices average lower than usual except for potatoes, which bring fair prices. Hay has been our most profitable crop. The season has been a profitable one, for, though prices are low and sales slow, the correspondingly low prices of what we buy evens things up. Taxes and interest, however, do not fall.

Northampton (D. A. HORTON). — Root crops with the exception of potatoes are not average. Farm stock is in good condition. Fall seeding is in first-class condition. Winter apples are selling at from 60 to 65 cents per barrel. Prices for crops raised for market have been about average. Cabbages have been our most profitable crop, and apples our least profitable one. Considered as a whole the season has been rather better than last year.

Westhampton (F. A. BRIDGMAN). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Scarcely any winter apples have been marketed, and the prices are very low, about 50 cents per barrel. The price for potatoes is much higher than formerly, but the crop is short. Many people depend upon their dairies for income, but butter from creameries brings so low a price that it hardly pays to keep cows. Farmers generally have hard times.

HAMPDEN COUNTY.

Tolland (E. M. MOORE). — Root crops are fully up to the average. Farm stock is in fair condition, not extra. Fall seeding is in good condition, though continued wet weather has prevented the usual amount being sown. A small proportion of the winter apples have been marketed at \$1 per barrel; none sold for export yet. Prices are lower than in former years and are growing less every year. Corn has been our most profitable crop, and potatoes our least profitable one. The season has not been a very profitable one to our farmers.

Granville (JOSEPH WELCH). — Root crops have proved to be average. Farm stock is in very good condition. Fall seeding is in very good condition. No winter apples have been sold. The crop is very large, and the fruit is very fair and free from worm holes. Corn, apples and hay have been our most profitable crops, and tobacco and potatoes our least profitable ones. I think the season has been a profitable one.

Agawam (R. DEWITT). — Root crops have proved to be average, turnips being especially good. Farm stock is looking well. Prices for crops raised for market have ruled very low. Perhaps the

grass crop leads in profit when the price of hay is considered. We can tell better after the tobacco is sold; we hope good things for the raisers. Milk would seem to be least profitable when it brings but $2\frac{1}{8}$ cents per quart. The season has not been very profitable.

Wilbraham (H. M. BLISS). — Root crops, with the exception of potatoes, have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Half the winter apples have been sold, one-eighth going for export. Prices have ranged one-fourth less than formerly. Grass has been our most profitable crop, and potatoes our least profitable one. Considered as a whole the season has not been a profitable one. Cloudy and wet weather have delayed fall work so that it is not as far advanced as usual.

Monson (A. H. WHITE). — Root crops have not proved to be average. Farm stock is in very fair condition. Fall seeding is in good condition. Very few winter apples have been sold, and none have been sold for export; price about \$1 per barrel. Potatoes are a little higher than last year. Hay has been our most profitable crop, and apples our least profitable one. Considered as a whole the season has not been a profitable one.

WORCESTER COUNTY.

Dudley (J. J. GILLES). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in fair condition. I should judge that about 25 per cent of the winter apples were marketed, 50 per cent of which were intended for export. Prices have ranged from 10 to 30 per cent below former years, excepting for cabbages, which bring an average price. Cabbages have been our most profitable crop, and potatoes our least profitable one. Considered as a whole the season has been a profitable one.

Spencer (H. H. KINGSBURY). — The weather has been quite favorable for all root crops except potatoes. Farm stock is fully up to the average in health and condition. Fall seeding appears vigorous and thrifty and has growth enough to stand the winter weather. Not over one-tenth of the winter apples have been put in the market and none exported; price for No. 1 fruit, \$1.25 per barrel. Lower prices than usual have generally prevailed. Hay has been our most profitable crop, and potatoes our least profitable one.

West Brookfield (L. H. CHAMBERLAIN). — Root crops have not proved to be average. Farm stock is in good condition. Fall seeding is in very fine condition. Half the winter apples have

been sold and about half of those sold have gone for export; price 65 cents, including barrel. Prices have been about the same as in former years. Corn has been our most profitable and potatoes our least profitable crop. Considered as a whole the season has been a profitable one.

Burre (J. L. SMITH). — Farm stock is in good condition. Fall seeding is in extra good condition. One-half the winter apples are already marketed and two-thirds of the crop is sold to be delivered by December 1; price 60 cents per barrel F.O.B. in bulk. Very few are exported, most of them going to Philadelphia. Milk and apples bring lower prices than usual, but potatoes bring an average price. There has been no profit in any crop, and the season has not been a profitable one.

Royalston (A. J. RAYMOND). — Root crops have proved to be average. Fall feed has been good, and farm stock is in good condition. The wet weather has kept fall seeding looking well. About half the winter apples are sold at about \$1 per barrel. Prices are about as usual except for apples, which are lower. Hay has been our most profitable and apples our least profitable crop. I think the season has been an average one for profit.

Lancaster (S. C. DAMON). — Root crops have proved to be average. Farm stock is in average condition. Fall seeding is in extra good condition. One-fourth of the winter apples have already been marketed, with 75 cents per barrel as the highest price. Prices for farm crops have been no higher than in former years. Hay and eggs have been our most profitable crops, and potatoes our least profitable one. Farming has been as profitable as any business in these times.

Princeton (PRESTON KNIGHT). — Root crops have been more than average. Farm stock is in very good condition indeed. Fall seeding is in very good condition. Very few winter apples have been marketed, and there are no buyers in this section; a few have exported, returns not yet received; local prices range from 50 cents to \$1.25 per barrel. Prices have not been over 75 per cent of those of two years ago. Root crops of all kinds have been most profitable, and apples least profitable. Considered as a whole the season has not been a profitable one.

Sutton (O. P. JOHNSON). — Root crops are very near an average. Farm stock was never in better condition. Fall seeding is not in very good condition. A small proportion of the winter apples have been sold at \$1 per barrel. Prices have not been quite so high as in former years. Hay is our most profitable crop, and apples our least profitable one. I think the season will compare favorably for profit with any average one.

MIDDLESEX COUNTY.

Marlborough (E. D. HOWE).—Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Not over 10 per cent of the winter apples are sold, and these were sold early for export at from 75 cents to \$1 per barrel. Prices are slightly higher than last year, but lower than formerly. Corn is perhaps our most profitable crop, and apples our least profitable one. Considered as a whole the season has been fairly profitable.

Concord (WM. H. HUNT).—Root crops have proved to be average. Farm stock is in average condition. Fall seeding has done well. But a small part of the winter apples have been marketed, at about \$1 per barrel; some have been exported, and some of the returns have been very low. Prices are better than last year. Asparagus, strawberries, sweet corn and cabbages have been among our most profitable crops, and apples and potatoes among our least profitable ones. This season has been better than last year for the truck farmers, but milk is less in price.

Carlisle (E. J. CARR).—Root crops are below the average. Farm stock is in good condition. Fall seeding is in good condition. The early apples and windfall Baldwins have been marketed; none exported. Prices are a little higher than in former years. Corn has been our most profitable crop, and potatoes our least profitable one. Considered as a whole the season has been fairly profitable.

Lowell (C. L. MARSHALL).—Root crops have been a little above the average if anything. Fall feed has been good, and farm stock is in good condition. Fall seeding is a good catch and promises well. Over half the winter apples have been sold, mostly to local parties, at very low prices. Prices for crops raised for market are above the average in most cases. Lettuce and asparagus have been our most profitable crops, and apples and potatoes our least profitable ones. The year has been a poor one on account of low prices.

Dunstable (A. J. GILSON).—Root crops are rather above the average. Farm stock is in good and healthy condition. Fall seeding is growing well and promises well for next year. The greater part of the winter apples have been or will be exported, and some farmers have received less than 25 cents per barrel for winter fruit. Prices have been lower than usual, except for potatoes. Potatoes and corn have been our most profitable crops, and apples our least profitable one. The season has not been as profitable as some former ones, as most farm products have been very low.

Winchester (MARSHALL SYMMES). — Root crops have been average, and beets and white turnips are especially good. Farm stock is in good condition. Fall seeding made a good catch, but has not a large growth. Windfall apples have been disposed of at about 50 cents per barrel; picked apples are stored for winter sale. There have been no high prices for farm crops, as in former years. Lettuce and tomatoes have been our most profitable crops, and string beans and potatoes our least profitable ones. Living profits have generally been made this season.

ESSEX COUNTY.

West Newbury (J. C. TARLETON). — Root crops have proved to be average. Farm stock is in very good condition. Fall seeding does not grow well, as it is too wet and cold. A very small proportion of the winter apples have been marketed and none were sold for export. Prices for crops raised for market have been low. Hay has been our most profitable crop, and potatoes and apples our least profitable ones. Considered as a whole the season has not been a very profitable one.

Groveland (ABEL STICKNEY). — Root crops have not proved to be average. Farm stock is in good condition. Fall seeding is looking very well, though perhaps a little late. Very few winter apples have been sold and a small number shipped for export. Prices are no better than formerly, if quite as good. Hay and corn have been our most profitable crops. Crops have been good, but prices are so low that the profits are small.

Topsfield (B. P. PIKE). — Root crops have proved to be average. Farm stock is in very good condition. Fall seeding is in very good condition. Ten per cent of the winter apples have been sold at from \$1 to \$1.25 per barrel. Prices for farm products are as good as last year. Hay and milk have been our most profitable crops, and corn our least profitable one. Our farmers all seem to get a living, and that is all they do any year.

Manchester (JOHN BAKER). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Very few winter apples have been sold; price for good fruit, \$1 per barrel. Prices for crops raised for market are a little lower than in former years. All our leading crops averaged low in regard to profit. Considered as a whole the season has not been at all a profitable one.

NORFOLK COUNTY.

Franklin (C. M. ALLEN). — Root crops have been very nearly average. Farm stock is in good average condition. Fall seeding

looks better than in September, but its growth is late and tender. Half the winter apples are sold at \$1 per barrel, mostly for local use. Prices have been low, but about as in former years. Potatoes have been our most profitable crop, and corn our least profitable one. Considered as a whole the season has not been a profitable one.

Cohasset (E. E. ELLMS). — Root crops have proved to be average. Farm stock is in excellent condition. Fall seeding is in good condition. About three-fourths of the winter apples are gathered and one-half sold for export at 50 cents per barrel without barrels. Prices for crops raised for market have been favorable this season. Grass has been our most profitable crop, and potatoes our least profitable one. Considered as a whole the season has been a profitable one.

BRISTOL COUNTY.

Easton (H. M. THOMPSON). — Root crops have proved to be average. Farm stock is in very good condition. Fall seeding is doing well with good prospects of weathering the winter. Apples here are as a rule stored over or into the winter, when they bring better prices than sales would realize now. Prices of crops have compared unfavorably with former years. Hay has been our most profitable crop, and potatoes our least profitable one. Considered as a whole the season has not been a profitable one.

Seekonk (SOLON CARPENTER). — Root crops have proved to be average. Farm stock is in very good condition. Fall seeding is in very good condition. There are not many apples this year and the crop has been sold at low prices. The prices for farm crops are better than last year. Strawberries have been our most profitable crop. Considered as a whole the season has been a profitable one.

Somerset (JOSEPH GIBBS). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Three-fourths of the winter apples have been sold at from 30 to 40 cents per barrel. Hay has been our most profitable crop, and potatoes our least profitable one. All crops have been fairly good, but prices have ruled so low that few farmers have made expenses.

Fairhaven (F. C. LYON). — Root crops, except potatoes, have proved nearly average crops. Farm stock is in good condition. The condition of fall seeding is excellent. About one-third of the apple crop has been sold at from \$1 to \$1.50 per barrel. Prices have been about the same as in former years. Hay has been our

most profitable crop, and potatoes our least profitable one. Judging from the full barns and cribs the year has been a profitable one.

PLYMOUTH COUNTY.

Marshfield (J. H. BOURNE). — Nearly all root crops, excepting potatoes, have proved to be average. Farm stock is in a little better condition than usual. Fall seeding is in extra good condition. Only a small proportion of the winter apples have been marketed and prices are low; none exported. Prices are even lower than last year at this time. Milk has been our most profitable product, and potatoes our least profitable one. Considered as a whole the season has been a little less profitable than usual.

Halifax (G. W. HAYWARD). — Root crops have proved to be average, except that potatoes are not quite up. Farm stock is in excellent shape, as feed has been good. Fall seeding made a good catch. Winter apples are being sold in the local markets at \$1 per barrel; very few sold for export. Last year is the only year in which prices have been as low as they now are. Hay and corn have been our most profitable crops, and onions, potatoes and market-garden crops our least profitable ones. If corn and potatoes sell at fair prices the season will be a profitable one.

Kingston (J. H. CUSHMAN). — Root crops have proved to be a full average. Farm stock is in very good condition. Fall seeding looks very good where it was sown early. Apples are all gathered, but there are no sales as yet. Prices are about average with former years. Hay has been our most profitable crop, and apples have been our least profitable one. Considered as a whole the season has compared well with other years.

Lakeville (ELBRIDGE CUSHMAN). — Root crops have proved to be average. Farm stock is in extra good condition. Fall seeding is in very good condition. A very small proportion of the winter apples have been marketed at an average price of \$1 per barrel; none exported. Prices for farm crops have ruled below the average. Hay has been our most profitable crop, and cranberries our least profitable one. The season has not been a profitable one, as prices have been low and the demand slow even then.

BARNSTABLE COUNTY.

Falmouth (D. R. WICKS). — Root crops are below the average. Farm stock is in good condition. Fall seeding is looking finely. Apples sell at from \$1.25 to \$1.75 per barrel; none exported. Prices for farm crops have been about average. Sweet corn has

been our most profitable crop, and potatoes our least profitable one. The season has been a very unsatisfactory one, as we suffered from drought, insect pests, blasts, blights and hail storms to an unprecedented degree.

Sandwich (J. R. HOLWAY). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is in good condition. Some crops have brought very low prices, and others have been fully up to the average. Crops through this section have been almost a failure this year, with the exception of cranberries and one or two other minor crops. Considered as a whole the season has not been a profitable one.

Chatham (E. Z. RYDER). — Root crops have proved to be average. Farm stock is looking well, having had plenty of good feed. Fall seeding is in fine condition. Apples are very cheap, very few having been sold as yet; most of them will be sold at home at low prices. Prices for farm crops have been much the same as in other years. Potatoes, turnips, green corn and strawberries have been our most profitable crops, and cranberries our least profitable one. Our farmers have made a very profitable season. They sell to the summer trade and therefore get good prices.

Eastham (J. A. CLARK). — I should say that root crops would be a fair average. Farm stock is in good condition. Fall seeding is in good condition. There are not many apples for market, but plenty for home use. Prices are low as a rule. Asparagus has probably been our most profitable crop, and potatoes our least profitable one. As to profit, we will all make out to live and pay our bills.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Root crops have proved to be average. Farm stock is in good condition. Only a small proportion of the winter apples have been marketed. Prices for crops raised for market are somewhat lower than in former years. Hay has been our most profitable crop, and corn our least profitable. Considered as a whole the season has not been a profitable one.

BULLETIN OF
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CONCENTRATED FEED STUFFS.

By J. B. LINDSEY, Ph.D., *Department of Foods and Feeding, Hatch Experiment Station.*

The term "concentrated feed," taken in its broadest sense, is meant to include the grains and other seeds of agricultural plants, as well as their manifold by-products left behind in the process of oil extraction and in the preparation of human foods.

All cattle feeds, either concentrated or coarse, are made up of six groups of substances: Water, ash, cellulose or fiber, fat, protein and non-nitrogenous extract matter.

Water.—The several grains and by-products contain when placed upon the market from 8 to 15 per cent of water.

Crude Ash represents the mineral ingredients of the seed. It will remain behind as ashes should the seed be burned. These ashes consist of lime, potash, soda, magnesia, iron, phosphoric acid and sulphuric acid.

Crude Cellulose or Fiber is the coarse or woody part of the plant. It may be called the plant's framework. It is present as a rule only to a limited extent in the grains and by-products.

Crude Fat includes not only the various fats and oils found in different feed stuffs, but also waxes, resins and coloring matters. It is sometimes termed ether-extract, because it represents that portion of the plant soluble in ether. Fat found in grains and seeds is comparatively free from foreign substances (waxes, resins, etc.).

Crude Protein is the general name for all of the nitrogenous matters of the seed. It corresponds to the lean meat in the animal,

and may be termed "vegetable meat." It has the same elementary composition as animal flesh, and is considered the most valuable part of the concentrated feeds.

Non-nitrogenous Extract Matter consists of sugars, starch and gums. The grains are very rich in starch and similar substances.

Carbohydrates. — The fiber and extract matter have the same functions in the process of nutrition, and collectively they are termed carbohydrates.

Nutritive Ratio. — The numerical relation which the protein of a feed bears to the carbohydrates (and fat reduced to carbohydrates) is termed its nutritive ratio. Fat is multiplied by $2\frac{1}{2}$ to convert it into carbohydrates. If a ton of feed should contain 96 pounds of digestible protein, and 928 pounds of digestible carbohydrates, it would have 9.4 times as much carbohydrates as protein or 1 : 9.4, which is its nutritive ratio.

Digestibility. — Any feed-stuff is valuable as a source of nourishment only so far as its various parts can be digested and assimilated. That the concentrated feeds are much more digestible than the coarse fodders may be shown from the following table : —

TABLE I.

	100 POUNDS TIMOTHY HAY CONTAINS :			100 POUNDS COTTON-SEED MEAL CONTAINS :		
	Composi- tion.	Per Cent Digestible.	Pounds Digestible.	Composi- tion.	Per Cent Digestible.	Pounds Digestible.
Water, . . .	15.0	—	—	8.0	—	—
Crude ash, . .	4.3	—	—	6.9	—	—
Crude fiber, . .	28.4	58	16.47	6.8	32	2.2
Crude fat, . .	2.4	61	1.46	10.7	93	10.0
Crude protein, .	6.3	48	3.02	41.6	88	36.6
Extract matter, .	43.60	63	27.46	26.0	64	16.5
Total, . . .	100.00	—	48.41	100.00	—	65.3

The timothy hay has but 48.4 pounds of digestible matter, while the cotton-seed has 65.3 pounds.

In addition to their increased digestibility the concentrated feeds as a rule possess a much higher protein content than the coarse fodders. The above table shows the extremes, the timothy having 3.02 pounds and the cotton-seed 36.6 pounds in 100.

I. — CLASSIFICATION OF THE CONCENTRATED FEEDS.

TABLE II.

DIVISION I.	DIVISION II.
<i>Medium to high in protein. Medium in carbohydrates.</i>	<i>Low in protein. High in carbohydrates.</i>
75 to 85 per cent digestible.	75 to 85 per cent digestible.
Cotton and linseed meals, gluten meal, pea and bean meals, peanut meal, gluten feeds, corn oil cake, Atlas meal, Chicago maize feed, Hall's dairy feed, dried brewers' grain, malt sprouts,* bran and middlings,* Boston and Quincy mixed feeds.*	Wheat, oats, barley, rye, Indian corn, corn and cob meal, corn-germ feed, hominy feed or chop, cerealine feed, rice meal, oat feeds.*

Below 12 per cent may be termed *low protein*, from 12 to 23 per cent medium protein, and above 23 per cent high protein. Below 50 per cent may be termed low carbohydrates, between 50 and 60 medium, and from 60 to 75 per cent high carbohydrates. All of the feeds in Division I. have a narrow nutritive ratio (1 : 2 to 1 : 5), and those in Division II. a wide ratio (1 : 8 to 1 : 10).

II. PREPARATION, COMPOSITION AND DIGESTIBILITY OF CONCENTRATED FEEDS.

DIVISION I.

Cotton-seed Meal. — The seeds of the cotton plant are black in color, irregular egg-shaped in form, and almost hidden by a tuft of white fiber which covers their surface. The meat of the seed is covered with a thick, tough hull. Machines have been invented to remove this hull, and the meat is subjected to warm pressure which removes the greater part of the oil. The pressed cake is ground, and results in the decorticated, bright yellow cotton-seed meal of commerce. Sometimes a considerable portion of the hull is ground with the meat, making a dark meal of inferior feeding value.

Linseed Meals. — The seeds of the flax are flattened elliptical oval, pointed at the lower end, and of a brown color. The seed in its natural state contains 30 to 35 per cent of oil. Twenty to 28 per cent of the oil of the seed can be removed by warm pressure. The pressed cake, dried and ground, furnishes the old process linseed meal. Some factories secure a more thorough removal of the oil by the use of naphtha or other solvent. The naphtha is removed by steam, and the dried material furnishes what has been

* From 60 to 70 per cent digestible.

known as the new process linseed meal. Flax meal is the particular name of new process meal put out by a single firm. Linseed meal is a very valuable and safe feed. The brand or brands highest in protein and lowest in fat are to be preferred. Linseed meals are generally known as oil meal. This is an incorrect name, the oil in many cases being very thoroughly removed.

Pea and bean meals are high in protein and fat. Peanut meal is very high in protein. They are all valuable feed stuffs, and quite generally used in European countries.

TABLE III.
Average Composition.

[Figures equal percentages or pounds per hundred.]

	Number of Analyses.	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Digestible in 100.
Prime cotton-seed meal, . . .	32	8.00	6.90	6.84	10.74	41.62	25.90	65.3
Poor quality cotton-seed meal, . .	*	10.60	7.20	24.90	6.60	24.70	26.00	41.6
New process linseed meal, . . .	8	8.30	5.90	8.50	2.90	36.10	37.30	71.8
Flax meal,	1	9.85	5.26	7.62	2.47	40.16	34.64	71.3
Old process linseed meal, . . .	8	9.70	6.20	7.80	6.60	33.10	36.60	68.4
Peanut meal,	*	11.50	4.90	5.20	7.30	47.00	24.10	70.4

Gluten Products.

The various products known as gluten meals, gluten feeds, germ feed and the like, are the residues resulting from the manufacture of starch and glucose (grape sugar) from maize or Indian corn.

The average of a large number of analyses of water-free Indian corn shows it to have the following composition:—

Crude ash,	1.7 per cent.
Crude fiber,	2.5 per cent.
Crude fat,	5.4 per cent.
Crude protein,	11.5 per cent.
Extract matter (chiefly starch),	78.9 per cent.

It is quite evident that the corn is made up chiefly of starchy matters. The removal of the larger part of the starch naturally increases the proportion of the other ingredients. The constituent contained in the corn next in amount to starch is the protein, — a general name for all albuminoids. In case of the corn it is called gluten, and after the removal of the starch, this being by far the most prominent constituent remaining, the feeds have been termed gluten feeds. Even in the best methods of manufacture, the starch is not all removed, the residues being often made up of one-half of starchy matter.

* Number not known.

Parts of Indian Corn. — The accompanying enlarged cut* of a corn or maize kernel will assist in locating the four distinct parts which are of interest in this study.

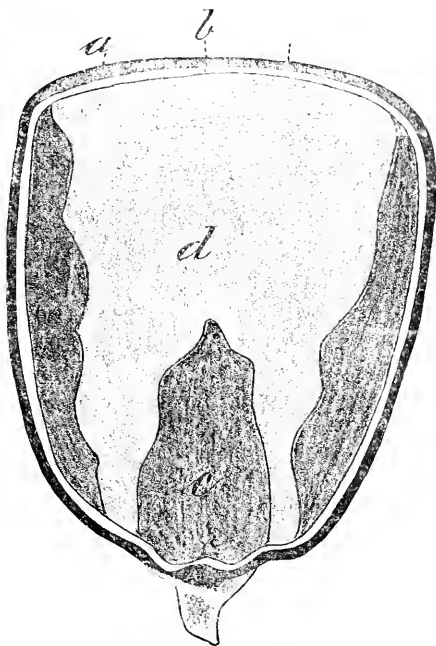
a is the husk or skin covering the whole kernel; it consists of two distinct layers, the outer and inner, which when removed constitute the bran and contain practically all of the crude fiber of the whole grain.

b is a layer of gluten cells which lie immediately underneath the husk; it is, as a rule, yellow in color and cannot be readily separated from the remainder of the kernel. This part is the richest of any in gluten.

c is the germ, which is readily distinguished by its position and form; it also contains gluten, though it is particularly rich in oil and mineral constituents.

The large portion (*d*) is composed chiefly of starch; the dark color indicates the flinty part in which the starch-holding cells are most closely compacted.

How the Parts are Separated.† — The corn is first soaked in warm water for many hours, until swollen and thoroughly softened. It is then run through stones set quite a distance apart. This rubs off the husk and the germ, and at the same time beats up the starch and the gluten. The mass is then sifted through fine sieves, the starch and gluten passing through, the husk and germ remaining behind to be separated if desired by gravity, the husks floating, and the germs sinking in the water. The starch and gluten which have passed through the sieves are separated by running into large tanks and settling, or by slowly running through long troughs. The starch being heavier settles to the bottom, while the lighter yellow gluten-containing material runs off from the top.



* This cut was kindly loaned by Director E. B. Voorhees of the N. J. Station. The description of the same is taken from Bulletin 105 of the N. J. Station.

† Taken from Bulletin No. 48, Vermont Experiment Station.

The by-product in this manufacture may either consist of one product, being a mixture of hulls, germ and gluten, or of three, when the hulls, germ and gluten are separated. The various gluten products are, however, all parts of the Indian corn, though they differ somewhat in color and general appearance.

Gluten Meal.

This product is generally composed of the gluten of the corn, the hull and germ having been separated. In some brands of gluten, the germ is evidently ground with the gluten, giving a product higher in fat. Here follows a table showing the average composition of the different brands of gluten meal :—

TABLE IV.

[Figures equal percentages or pounds per hundred.]

BRANDS.	Number of Analyses.	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Digestible.
Chicago gluten meal (old process), . .	3	9.2	.8	1.1	6.2	30.4	52.2	81.3
Chicago gluten meal (new process), . .	4	9.6	1.3	2.4	6.0	38.4	42.3	*
Manufactured by Chicago Sugar Refining Co., Chicago, Ill.								
Cream gluten meal,	1	9.0	.6	1.7	7.6	36.6	44.5	79.4
Chas. Pope Glucose Co., Chicago, Ill.								
King gluten meal,	2	7.2	1.7	1.4	19.1	34.6	35.9	80.1
National Starch Manufacturing Co., New York.								
Iowa golden gluten,	2	9.0	1.1	6.6	13.3	25.5	44.5	†
Firmenish Manufacturing Co., Marshalltown, Ia.								
Hammond gluten,	1	8.2	1.1	1.5	9.7	29.9	49.6	†
Stein, Hirsh & Co., Chicago, Ill.								

The new process Chicago gluten is superior to that formerly sold, because it contains a noticeably higher percentage of protein. This is due to a more thorough removal of the starch, and possibly to a saving in gluten formerly lost in the manufacturing process. The Cream gluten closely resembles the Chicago. The King gluten meal contains a high percentage of fat.

The Golden gluten contains considerable hull, and probably the germ, ground with the gluten, which results in a lower protein percentage.

Hammond gluten meal resembles the old process Chicago.

Gluten meals containing low percentages of fat are safer to feed

* Probably about the same as old process.

† Not determined.

than those containing high percentages. Excess of fat tends to produce inflammation of the milk glands (*garget*).

All of the gluten meals, Iowa excepted, are very low in fiber; these products are classed with the cotton and linseed meals as the most concentrated feed stuffs. They are heavy and when fed in any quantity should be mixed with some lighter material, such as bran.

Gluten Feeds.

The gluten feeds consist of the hull, germ and gluten of the corn mixed and coarsely ground together. They contain more fiber and fat and less protein than the gluten meals. They are more bulky and are safer to feed by themselves than the gluten meals.

TABLE V.

Average Composition of Gluten Feeds.

[Figures equal percentages or pounds per hundred.]

BRANDS.	Number of Analyses.	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Digestible.
Buffalo gluten feed (old process), . . .	15	8.1	.9	6.8	11.9	23.0	49.3	77
Buffalo gluten feed (improved process), American Glucose Co., Peoria, Ill.	1	10.4	2.6	6.7	4.4	27.1	48.8	
Peoria gluten feed, Peoria Grape Sugar Co., Peoria, Ill.	4	7.2	1.2	7.6	12.4	20.5	51.1	
Diamond gluten feed, . . . Rockford Sugar Refining Co., Rock- ford, Ill.	1	8.4	1.1	7.3	10.2	22.0	51.0	
Chicago maize feed, . . . Chicago Sugar Refining Co., Chicago, Ill.	5	8.2	.6	7.5	7.1	24.9	51.7	70
Atlas gluten, . . . Atlas Distilling Co., Peoria, Ill.	7	7.4	1.7	11.0	12.4	30.3	37.2	
Dried brewers' grain (high protein), . .	2	7.5	2.9	12.3	6.5	31.4	39.4	62
Dried brewers' grain (low protein), . .	4	9.9	4.1	10.2	4.4	21.0	50.4	66

The improved Buffalo gluten feed is said to be produced by increasing the percentage of ash, the recovery and addition of some of the gluten formerly lost, and in the extraction of the fat. The one analysis of improved feed given above bears out this statement. The Chicago maize feed has less fat and rather more protein than the ordinary gluten feeds.

Atlas Gluten Meal,* so called (better gluten feed), is quite different from the regular glutens. It is the by-product resulting from

* Atlas feed and brewers' grain are not corn by-products. They consist of hulls, germ and gluten of different grains, and the process of preparation is different from the regular gluten feeds. It is thought best, however, to speak of them at this time.

the manufacture of liquor from the various grains. The process consists practically in the removal of a considerable portion of the starch by fermentation. The residue is kiln-dried and consists of the hulls, gluten, germ, and part of the starch. It has a slightly acid smell and taste. The uncertainty in its composition detracts from its value. Analyses have shown it to be equal to, and in some cases superior to gluten feeds.

Dried Brewers' Grain * is the residue from beer manufacture. It consists of some of the starch, together with the hulls, germ and gluten of the barley. A small portion of the gluten and the larger part of the starch have been removed by extraction and fermentation. It varies considerably in composition and has been designated as high and low in protein.

Miscellaneous Feeds. (Division I.)

Wheat Bran and Middlings. — Wheat has the same general formation as the corn kernel. The bran is the exterior covering of the wheat, and is removed by machinery in the process of flour manufacture. Middlings is the layer below the bran, and contains more starchy matter and less fiber. These feed stuffs vary more or less in quality, depending upon the quality of the wheat, process of flour manufacture, etc. Careful analyses and digestion tests made at the experiment station have failed to note any material difference in the feeding value of selected spring and winter wheat bran.

Boston and Quincy Mixed Feeds. — These have also been termed heavy brans. They are mixtures of bran and cheap flour. Analyses thus far made indicate that they would prove slightly superior in feeding value to bran alone. Mixed feeds are of very uncertain composition, however.

Hall's Dairy Feed. — This is said to be a mixture of cotton-seed meal, gluten meal, bran, corn meal and ground oats. It resembles the gluten feeds in composition.

Malt Sprouts. — Malt used in beer manufacture is prepared by moistening barley and allowing it to sprout. The sprouting produces a ferment called diastase, which changes starch into sugar. After the formation of the diastase, which requires a certain number of days, the barley is dried, and the sprouts removed by machinery and sold for cattle feed. The barley is now termed malt.

* Atlas feed and brewers' grain are not corn by-products. They consist of hulls, germ and gluten of different grains, and the process of preparation is different from the regular gluten feeds. It is thought best, however, to speak of them at this time.

TABLE VI.

Average Composition of Miscellaneous Feeds.

[Figures equal percentage or pounds per hundred.]

	Number of Analyses.	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Di- gestible.
Wheat bran,	49	10.6	6.8	9.8	4.5	16.1	52.2	60
Wheat middlings,	9	10.3	5.1	6.8	4.8	15.7	57.3	70
Boston mixed feed,	2	10.9	4.0	5.7	4.5	17.1	57.8	?
Quincy mixed feed,	1	9.7	5.4	7.1	4.6	16.7	56.5	?
Hall's dairy feed,	1	7.0	6.2	10.2	9.4	20.8	46.4	?
Malt sprouts,	5	9.6	5.9	11.0	1.7	24.8	47.0	58

DIVISION II.

Wheat, Barley, Oats, Rye and Indian Corn. — But very little need be said relative to the grains. They are concentrated feeds from which many of the concentrated by-products are derived. They are all very rich in starchy material and poor in protein and fiber.* Wheat, oats and barley contain as a rule 1 to 2 per cent more protein than corn and rye. Different varieties vary more or less in quality within narrow limits. Climatic conditions and fertility of soil also exert a very noticeable influence on the quality of the grains.

TABLE VII.

Average Composition of the Grains.

[Figures equal percentages or pounds per hundred.]

	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Di- gestible.
Wheat,	14.00	1.72	1.72	1.98	11.41	69.17	73
Barley,	14.00	2.32	2.58	1.72	11.95	67.43	73
Oats,	14.00	2.92	9.29	4.82	11.35	57.62	58.5
Rye,	14.00	1.81	1.63	1.63	10.33	70.60	?
Corn,	14.00	1.40	1.80	3.80	9.50	69.50	73.7
Corn and cob meal,	14.00	1.34	6.40	3.50	8.69	66.00	68.5

Corn Germ Feed. — This consists of the hulls and germ of the corn, coarsely ground. It is a by-product from glucose manufacture, but is classified here because of its low protein content. But very little is sold in Massachusetts at present.

Cerealine Feed. — This feed comprises the hull, bran, germ and some of the starch of the corn. It is the by-product resulting in

* Except oats, which contain 9 to 10 per cent of fiber.

the manufacture of the breakfast preparation known as cerealine. It is very coarse. In chemical composition it resembles corn meal. While no feeding tests are on record, it can be assumed to have a nutritive value similar or slightly inferior to corn meal.

Hominy Feed or Chop. — This is the by-product from the preparation of hominy from corn. It consists essentially of the same materials as cerealine, which it resembles very closely in composition. It is quite finely ground. The separation of hull, bran and germ is said to be brought about solely by the aid of machinery and steam.

Rice Meal. — In preparing rice for human consumption, various mechanical processes are employed. After the hull is removed, the rice is brought into mortars holding from four to six bushels each, and pounded, to remove the yellow gluey covering of the grain and give it the creamy color so much desired. This pounding really removes the chaff and some of the flour, and leaves the grain but little broken. The rice is then polished to give it a pearly lustre, which is effected by friction of the grains of rice against tanned moose hide. That portion rubbed off is termed rice polish. The chaff and flour above referred to, and in some cases the polish also, are mixed and sold as rice meal for cattle feeding. It is much used and highly prized in Europe, and small quantities are sometimes placed on our Massachusetts markets. It resembles corn meal in composition and feeding value.

Oat Feed, Corn and Oat Chop, etc. — Oat feed is the refuse from factories engaged in the preparation of oatmeal for human food. It consists of poor oats, oat hulls and some of the bran and starch which are removed in the process of manufacture. In some cases it is mixed with a poor quality of corn, as corn and oat chop. While it has the same type of composition as corn meal, it varies much in the quantity of hulls it contains, and consequently in feeding value.

TABLE VIII.
Average Composition.

[Figures equal percentages or pounds per hundred.]

	Number of Analyses.	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Pounds Digestible.
Corn germ feed,	9	7.35	1.08	10.85	10.80	11.27	58.65	
Hominy feed (all analyses), . .	12	11.10	2.50	3.80	8.30	9.80	64.50	
Hominy feed (recent analysis), .	1	7.77	2.88	4.27	9.76	11.75	63.57	
Cerealine feed,	2	9.91	2.63	5.32	8.86	12.11	61.17	
Rice meal,	1	10.00	8.40	5.63	13.17	11.59	51.21	66
Oat feed,	10	7.50	4.90	13.00	4.30	11.80	58.50	?

Excepting rice meal, the digestibility of the above feeds has not been determined, but it is probably slightly below corn meal. Oat feed would frequently show a decidedly inferior digestibility.

III. HOW BEST TO UTILIZE THE CONCENTRATED FEEDS.

Attention has already been called to the fact that such feeds are especially valuable because of their digestibility and high protein content. Home-grown coarse feeds on the contrary are of a starchy nature, and much less digestible. Now many experiments have shown that milch cows of 1,000 pounds live weight need the following quantities of digestible nutrients daily: Protein, 2.5 pounds; fat, .5 pound; carbohydrates, 13.0 pounds; total, 16.0 pounds; nutritive ratio, 1:5.4 pounds. Such a ration contains 16 pounds of total nutrients and about $5\frac{1}{2}$ times as much carbohydrates as protein, and it is said to be properly balanced. Now, if a cow should be fed all she would consume of any palatable, dry, coarse fodder, such as an average quality of hay, she would have at her disposal the following digestible constituents: Protein, 1.4 pounds; fat, 0.4 pound; carbohydrates, 12.4 pounds; total, 14.2 pounds; nutritive ratio, 1:9.5 pounds. Such a ration lacks in protein as well as in total digestible matter. It has 9.5 times as much carbohydrates as protein, and is said to be improperly balanced. It is in order to increase the protein and the total digestible matter, that recourse is had to the concentrated feeds. By the proper combination of these feeds, fed in approximately definite quantities daily, these ends can be attained. Here follows the *detailed* classification of the concentrated feeds made on the basis of the protein they contain: —

TABLE IX.

DIVISION I.			DIVISION II.
Class I.	Class II.	Class III.	Class IV.
Cotton-seed meal, peanut meal, linseed meals, Chicago, cream and King gluten meals, Golden and Hammond gluten meals.	Atlas meal (feed), gluten and maize feeds made from corn, dried brewers' grain.	Wheat bran and middlings, malt sprouts.	Wheat, barley, corn, rye, oats, corn germ feed, cere-aline, hominy and oat feeds.

The feeds in Class I. furnish the largest amount of protein, those in Class II. next largest, and so on. Those standing first in their class are richest in protein, and those last poorest. For practical purposes, in combining the various concentrated feeds into

rations, the feeds in each class may be regarded as having approximately equal feeding values, the market price governing the selection. Other things being equal, those standing first in their class are to be preferred (see comparative analyses of different feeds). The feeds in Class IV. are valued chiefly because they furnish a large amount of very digestible, starchy feed, and not because of their high protein content.

Concentrated grain mixtures for milch cows of 1,000 pounds live weight, to be fed with coarse feeds such as hays, straws, corn stover, corn ensilage, etc. :—

I.	II.	III.	IV.
100 pounds, Class I. 100 pounds, Class II. 100 pounds, Class IV. Mix and feed 5 to 7 quarts daily.*	100 pounds, Class I. 100 pounds, Class II. 100 pounds, Class III. Mix and feed 7 to 9 quarts daily.	100 pounds, Class I. 100 pounds, Class IV. Mix and feed 5 to 7 quarts daily.*	100 pounds, Class I. 150 pounds, Class III. Mix and feed 6 to 8 quarts daily.

By 100 pounds, Class I., etc., is meant the particular feed selected in the class, and not all enumerated under the class.

The mixtures are intended to be fed in connection with any coarse fodder combination. They are also suitable for growing neat stock, the quantity fed daily to be governed by the size of the animal. For fattening cattle, two-thirds of the mixture should consist of one of the feeds in Class IV., and one-third from Class II. or III.

In case a grain mixture is composed of three concentrated feeds, see during the winter that not more than two of the feeds have a high fat percentage and in summer not more than one. In case two feeds only are employed in the mixture, but one of them should have a high fat percentage, especially in summer. Those feeds especially rich in fat are cotton-seed meal, King gluten meal, Atlas gluten meal and the gluten feeds. Excess of fat, in summer especially, is very liable to produce inflammation of the udder.

The lesser amount of grain as specified above, fed together with the coarse feeds, will furnish about two pounds of digestible protein daily, and the larger amount two and one-half pounds. When cows derive part of their feed during the summer from pasture grass, and part from soiling crops, about one-half the quantity of the grain mixtures can often be fed to advantage. In case the soiling crops are made up of one-half leguminous fodder, no grain need be given. Should corn and soja bean ensilage or millet and bean

* If cerealine, hominy or corn germ feed is selected from Class IV., feed 7 to 9 quarts daily.

ensilage be fed in place of clear corn ensilage, the grain ratio can be reduced about one-third.

As the cow approaches the time of calving, the grain ration can be gradually reduced. The cow ought to go dry from 45 to 60 days.

TABLE X.

Showing the Comparative Commercial Values of the Different Feeds.

	Per Ton.	Per Ton.
Wheat bran,	\$18 00	\$14 00
Corn, wheat and barley meals,	19 00	15 00
Oat meal,	17 00	13 00
Hominy and cerealine feeds,	18 00	14 00
Oat feed,	16 00	12 50
Rice meal,	21 00	16 00
Wheat middlings,	21 00	16 00
Brewers' grains,	21 00	16 00
Malt sprouts,	23 00	18 00
Gluten and maize feeds,	28 00	22 00
Atlas meal (feed),	28 00	22 00
O. P. linseed meals,	31 00	24 00
N. P. linseed meals,	32 50	25 00
Gluten meal (first grade),	35 00	27 00
Gluten meal (second grade),	31 00	24 00
Cotton seed meal,	35 00	27 00

The *comparative* dollars and cents values of the feeds as given in the above table *do not* express their specific physiological effects in the process of nutrition. The figures are intended to show *comparative* and not actual commercial values. They are obtained by figuring the digestible protein, fat and carbohydrates at similar prices per pound. The table shows that when wheat bran sells for \$18 per ton in the market, corn meal should be worth \$19, wheat middlings \$21, brewers' grains \$21, etc. Again, should wheat bran sell for \$14, corn meal would be worth \$15, middlings \$16, etc. The prices of themselves have nothing to do with suitable concentrated feed combinations, but are to be used as economic guides in purchasing. Thus should corn meal sell at \$23 per ton, and gluten feed at \$21 per ton, it would not, for economical reasons, be advisable to use grain mixtures containing corn meal.

IV. FERTILIZING VALUE OF CONCENTRATED FEEDS.

Aside from their direct feeding effects, all feed stuffs have a distinct fertilizing value. This value depends chiefly on the amount of nitrogen (protein = nitrogen multiplied by 6.25) they contain, those that are highest in that ingredient being most valuable. Some feed stuffs, such as cotton and linseed meals, bran, and brewers' grain, contain considerable quantities of phosphoric acid and potash.

TABLE XI.

Showing Approximate Pounds and Value of Nitrogen, Phosphoric Acid and Potash in One Ton; also Comparative Fertilizing Value, 1 being poorest.

DIVISION I.

	Nitrogen.	Phosphoric Acid.	Potash.	Money value.	Comparative values.
Cotton-seed meal,	134	50	36	\$20.13	3.7
Linseed meals,	115	34	25	16.58	3.0
Chicago, cream and King gluten meals,	120	8	traces	14.76	2.7
Iowa and Hammond gluters,	88	8	traces	10.92	2.0
Gluten and maize feeds,	75	8	traces	9.36	1.7
Atlas meal,	96	5	3	11.89	2.2
Dry brewers' grain,	70-100	20	traces	11.10	2.0
Wheat bran,	50	42	28	9.29	1.7
Malt sprouts,	78	32	34	12.50	2.3

DIVISION II.

Grains, hominy, cerealine and oat-feeds,	36	14	10	\$5.50	1
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The above table shows that cotton, linseed and gluten meals possess the highest fertilizing value, and that they contain from 2 to 3.7 times as much value in fertility as do the grains and allied products. Such feeds, therefore, when fed to animals, produce a rich manure.

The concentrated feeds, being easy to handle, can be applied directly to the land, and as good results obtained as from various forms of commercial fertilizing material of a similar nature. When the concentrated feeds are first fed to farm animals, from 80 to 90 per cent of the fertilizing value of the feeds reappears in the manure, providing the latter is carefully preserved. The same amount of plant food as it exists in animal excrement, is by no means as valuable from a commercial standpoint, as a like amount in the form of concentrated feed, for the very reason that it costs so much more to handle it. It is as a rule, nevertheless, considered better economy in a system of mixed farming, to first secure the feeding effects of the feeds, and then their fertilizing value in the manure.

V. IS THERE NEED OF A LAW TO CONTROL THE SALE OF CONCENTRATED FEED STUFFS?

I think this question can be answered very decidedly in the affirmative, and I desire to state the reasons why.

Every purchaser of concentrated feed stuffs realizes the great variety of such substances that are offered for sale, and the immense quantities that are being yearly consumed by our Massachusetts farmers. Those enumerated in the preceding pages are the most important ones now in our markets. Scarcely a year passes but that several new articles, generally by-products from different industries, of uncertain composition, find their way into the trade. Now while these substances contain some of each of the several groups of feed constituents — protein, fat and carbohydrates — they are purchased chiefly for the protein they contain. The fodder crops grown by the farmer are nearly all rich in starchy materials, and he has recourse to these by-products to supplement his home-grown starchy feeds, in order to produce well-balanced fodder rations for his cattle. These various by-products contain from 10 to 45 per cent of protein, as well as from 3 to 20 per cent of fat. Now an excess of fat in a concentrated feed is objectionable, because of its liability to produce inflammation of the udder (*garget*). A feed stuff containing from 7 to 9 per cent can be fed with a greater degree of safety. An excess of by-products high in fat and protein, fed to animals, is sure to cause trouble. It is, therefore, very important that the farmer should have the privilege of knowing the amount of the important constituents contained in the feed he is purchasing, and it is only fair play for the manufacturer to state *the quality* of the goods he offers for sale.

Again it is a fact that the larger number of these individual brands of feed stuffs vary, from time to time, very seriously in composition. This I desire to prove from actual analyses made at the Massachusetts Experiment Station within the last two years.

Cotton-seed Meal.

	PRIME QUALITY.	POOR QUALITY.*						
	Average 32 Analyses.	I.	II.	III.	IV.	V.	VI.	VII.
Water, . . .	8.00	8.00	8.00	†	†	10.00	†	8.00
Crude fat, . . .	10.74	†	†	†	†	†	†	6.69
Crude protein, .	41.62	12.81	21.75	22.88	23.40	26.56	30.62	32.34

These poor quality meals were quite dark in color and contained the hulls ground with the meat. They were usually offered at from one to two dollars less per ton than prime meal, on the ground

* All analyses made in 1896.

† Not determined.

that they were a little "off color." The larger part of them were really not worth much over one-half as much as prime meal.

Gluten Meals.

The *better class* of gluten meals has been fairly even in composition of late. At least one manufacturer prints the guaranteed composition on the bags. Such an article is of extra quality, and the manufacturer is desirous of stating the fact. There have been many gluten meals tested at the experiment station, however, varying from 25 to 32 per cent in protein, while a high grade meal will contain from 35 to 38 per cent. Here follows the extremes of 38 analyses of gluten meals:—

	Protein.	Fat.
Highest,	39.3 per cent.	21.44 per cent.
Lowest,	25.7 per cent.	3.92 per cent.

Gluten Feeds.

The tendency of one or two of the well-known brands of gluten feeds is to remain fairly steady in composition. We find, however, variations of from 8 to 13 per cent in the fat, and from 15.3 to 23.1 per cent in the protein.

	I.	II.	III.	IV.	V.	VI.	VII.
Water (per cent),	9.00	8.00	9.00	8.00	7.00	8.00	8.00
Crude fat (per cent), . . .	11.55	8.10	13.50	12.50	13.30	13.56	13.60
Crude protein (per cent), .	15.30	18.90	20.10	19.60	21.10	22.26	23.10

Atlas Gluten Meal.

The following variations of this feed stuff have been noted since its appearance in our markets:—

	I.	II.	III.	IV.	V.	VI.
Water (per cent),	8.00	7.00	5.00	11.00	9.00	8.00
Crude fat (per cent),	10.30	11.50	13.30	13.53	11.92	14.40
Crude protein (per cent), . .	22.60	26.50	31.00	33.20	35.30	37.26

There is a difference of nearly three hundred pounds of protein in one ton, in different samples of this feed; and the farmer is asked to pay the same amount of money per ton in all cases.

Oat Feeds.

	I.	II.	III.	IV.	V.	VI.
Water (per cent),	10.00	6.50	8.00	10.00	7.00	10.00
Crude fat (per cent),	3.02	3.25	3.00	4.23	4.50	3.90
Crude protein (per cent),	8.19	8.75	9.20	10.18	11.10	14.00

Attention is called to the great variation in the percentage of protein present, namely: from 8.2 to 14 per cent. Sample I. would contain 164 pounds, and sample VI. 280 pounds, per ton, a difference of 42 per cent.

Mixed Feeds.

	BOSTON MIXED FEED.		QUINCY MIXED FEED.	HEAVY BRAN.	
	I.	II.		I.	II.
Water (per cent),	10.00	11.00	10.00	9.00	9.00
Crude fat (per cent),	4.46	5.23	4.58	5.24	3.95
Crude protein (per cent),	15.12	21.60	16.70	15.20	18.20

These mixtures of bran and flour vary from 15.1 to 21.6 per cent of protein.

Dried Brewers' Grain.

	I.	II.	III.	IV.	V.
Water (per cent),	8.00	8.00	8.00	7.00	8.00
Crude fat (per cent),	7.40	5.50	7.80	6.70	6.30
Crude protein (per cent),	14.80	17.20	26.70	29.80	33.00

While this article is not sold in our markets to any extent just at present, samples obtained a year ago showed the above variations.

The figures given, and many more that could be cited were it necessary, prove conclusively that the concentrated feeds vary widely in composition and in consequent feeding value.

Recognizing then, firstly, the large number of concentrated by-products in our Massachusetts markets with very different feeding and commercial values, and secondly, that the large majority of these feeds differ quite widely of themselves in composition, and thirdly, that these feed stuffs are purchased by the farmer primarily for their protein content, it is but fair that the manufacturers should be obliged to state the amounts of the most costly

and valuable ingredients (from a feeding standpoint) which they contain. The law should further provide that these feed stuffs be inspected at intervals, to see if they are as represented. The farmers simply ask that the manufacturer state what he sells, and sell what he states. The farmer is willing to pay a fair price for his goods. *He objects, however, most decidedly, to be obliged to part with his hard-earned dollars for materials of variable and consequently uncertain quality. Every advantage is, at present, on the side of the manufacturer. The farmer takes all the chances.*

Prof. C. A. Goessmann, in writing on the same subject, has recently used the following language : —

Names may remain the same, while the composition of the article suffers serious changes, in consequence of changes in the parent industry.

Sales without due responsibility regarding the particular quality of the goods delivered leaves the pecuniary risk involved in the transaction in an objectionable degree on the side of the buyer.

The trade in concentrated feed stuffs is to-day in a similar unsatisfactory condition, as was the trade in commercial fertilizers before the introduction of a system of State inspection.

The best interests of both manufacturers and farmers render such changes desirable as will impose mutual and equitable responsibility on all parties interested in the transaction.

The limited margins for profit in every branch of animal industry necessitate a most careful attention to all details of the business.

